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**CANADIAN PUBLIC HEALTH  
ASSOCIATION**

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**OTTAWA**

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## Prevention and Treatment of Scarlet Fever

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THE causative agent of scarlet fever was for many years the subject of controversy. Between 1883 and 1894 various investigators, who based their deductions on clinical observation and the presence of numerous streptococci in the throats of patients, concluded that scarlet fever was caused by streptococci, and that the absorption of their toxins produced the characteristic rash. This view was vigorously opposed. In 1895 Marmorek (1) and later Moser (2) treated patients successfully with antitoxic serum prepared by immunizing horses with broth cultures of streptococci. Savchenko (3) in 1905 obtained similar results with serum from horses immunized with the toxic supernatant of centrifuged broth cultures. Gabritschewsky (4) in the same year immunized children with killed broth cultures of streptococci, which presumably contained toxin. He also observed reactions closely resembling mild scarlet fever in the course of the immunization of susceptible children, whereas these reactions were absent when children who had previously had scarlet fever were injected with the same vaccine. Since there was at that time no way of standardizing either antiserum or vaccine, both fell into disrepute.

In 1923 G. F. Dick and G. H. Dick (5) produced scarlet fever experimentally in one out of 5 human volunteers by swabbing their throats with a culture of haemolytic streptococci obtained from the finger of a patient with scarlet fever. Five other volunteers, similarly swabbed with filtrate from the culture, failed to show symptoms. When these volunteers were later swabbed with the culture, one developed scarlet fever, and several had sore throats but no rash. These results were confirmed by Nicolle, Conseil and Durand (6) and by Toyoda, Futagi and Okamoto (7).

Dochez (8) in 1924, produced a potent antiserum by immunizing a horse with living culture localized by injecting it into nutrient agar previously injected under the skin. Owing to the previous work of Schultz and Charlton (9), it was possible to test the potency of the serum by injecting it intradermally into scarlet fever patients. The local blanching of the scarlet fever rash which occurred when the serum was injected intradermally, as well as the improvement in patients who were treated with it, indicated that the serum was antitoxic in its effect. In the same year the use of the toxin as a test of susceptibility and a means of assaying antitoxin, as well as for immunization, was reported by Dick and Dick (10).

It is now generally accepted that scarlet fever is caused by a haemolytic streptococcus capable of producing a soluble exotoxin. In one sense the specificity of this micro-organism is not sharply defined, for many infections other than scarlet fever are due to haemolytic streptococci. The majority of strains from such non-scarlatinal infections produce as strong toxin as do the strains isolated from cases of scarlet fever. On the other hand, qualitative differences between the toxins exist even among the scarlet fever strains themselves, so that an individual may be immune, as gauged by an intradermal test, to some scarlet fever toxins and susceptible to others (11, 12, 13).

#### *Isolation of Haemolytic Streptococci*

The isolation of haemolytic streptococci from early cases, contacts and suspected carriers by means of swabs cultured on blood agar is at times a very useful adjunct to clinical procedure. It is necessary to obtain thorough contact of the swab with the infected area, and to spread the blood plate thinly so that the characteristic haemolytic colonies will not be concealed by the overgrowth of other bacteria. The blood agar should not contain dextrose since some strains fail to show haemolysis if dextrose is present. A small proportion of strains are haemolytic in deep culture but not on the surface; these may be recognized if a few cuts are made into the agar while spreading the culture with a loop. Further identification of haemolytic streptococci is a laborious and time-consuming laboratory procedure. There is at present no satisfactory way of differentiating strains found in scarlet fever from those found in other human infections. Although toxin production is essential to scarlet fever strains, it is not an effective means of classification since it also occurs in many strains from lesions other than scarlet fever. Classification according to the fermentation of carbohydrates and agglutination does not correspond with the recognized clinical groups. A definite advance has been made by Lancefield (14) who, by means of precipitin reactions, has separated strains usually pathogenic for man from those rarely found in human lesions. The fibrinolysin test of Tillett and Garner (15) also promises to be of some value in this respect.

#### *The Dick Test*

The Dick test, introduced in 1924, is a means of determining susceptibility to scarlet fever. Essentially it is the intradermal injection of a minute quantity

of scarlet fever toxin; in susceptible persons this causes a local erythema at the site of injection; in immune persons no reaction occurs. The toxin for the Dick test is prepared by growing standard scarlet fever strains in broth under conditions recommended by the Scarlet Fever Committee\*; the sterile filtrate from this culture is carefully standardized and diluted with normal saline so that 0.1 cc. contains one skin-test dose. The skin-test dose is a unit which has been established by the Scarlet Fever Committee as representing the least amount of toxin to which all susceptible persons will react positively; it is based on skin tests of a very large number of children of different ages.

The reliability of the Dick test depends largely on the potency of the test material and on careful adherence to the technique of the test. As concerns the potency of the test material, one should bear in mind that deterioration occurs in time, even at refrigerator temperature; at room temperature or higher, deterioration is much more rapid. Syringes should be sterilized by boiling. In order to guard against dilution, the syringe should be rinsed with a small amount of Dick-test solution before filling. If needles are flamed or changed, a small amount of the Dick-test solution should be expelled before the next injection. Unnoticed leaks between the barrel and plunger of the syringe may reduce the volume injected.

In performing the test, 0.1 cc. is injected intradermally into the flexor surface of the forearm at the junction of the middle and upper third. The reaction is read in bright daylight in 22-24 hours; an area of redness 1 cm. or more in diameter, however faint, is considered positive. The commonest error in interpretation is to read faint reactions as negative. According to the Dicks, a negligible proportion of the subjects tested react positively to a control of heated toxin, hence a control is not included in the test.

In general, the Dick test is reliable. The toxin contained in one skin-test dose is the amount which has been found to give a correct result in the largest proportion of persons tested; it indicates whether there is sufficient antitoxin to neutralize the toxin injected, but gives no information as to how much more or less than this amount is present. Titrations of the antitoxin content of the serum of Dick-positive and Dick-negative persons indicate that Dick-negative persons have at least one unit of antitoxin per cc. of serum and may have more than 12 units per cc. (16). One might therefore expect that an exceptionally toxic strain would cause scarlet fever in a Dick-negative person whose antitoxin titre was at the lower limit of this range. Some discrepancies in the result of the Dick test may be attributed to failure to develop immunity following an attack of scarlet fever; this has also been confirmed by titration of the serum. Some Dick-positive subjects whose serum contains antitoxin have been found to react positively to a control skin-test. Occasionally a small positive reaction occurs in a subject who was previously negative.

Other discrepancies in the Dick test may be attributed to the difference between the toxins of different scarlet fever strains (17). The scarlet fever

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\*Licensors for the Dick patents relating to scarlet fever toxin and scarlet fever antitoxin.

antitoxin in routine use neutralizes the toxin used in the Dick test but fails to neutralize the toxins of about 10 per cent. of the strains isolated from patients (13). When exposure to such strains occurs, one might expect even Dick-negative persons to develop scarlet fever. Two cases have been observed in which antitoxin was given one day and five days previous to the development of a scarlet fever rash. In both cases the strain isolated from the patient produced toxin which was not neutralized by the scarlet fever antitoxin used for prophylactic treatment. The Dick test of one of the patients was known to be negative before the onset of scarlet fever.

#### USE OF SCARLET FEVER TOXIN FOR ACTIVE IMMUNIZATION

There is ample evidence that the toxin of haemolytic streptococci is antigenic, but in the practical application of immunization, difficulties arise which are not encountered in the use of some other antigens such as diphtheria toxoid or tetanus toxoid. The active immunization of hospital personnel, particularly nurses, and of children living in institutions has been quite generally adopted. It has also been used fairly frequently to cut short epidemics of scarlet fever in schools and other institutions.

Active immunization of the nurses has been carried out at the Hospital for Sick Children, Toronto, since 1925, at the General Hospital at Saint John and Hamilton since 1926, and at the General Hospital, Kingston, and Victoria Hospital, London, since 1927. A comparison of the number of cases of scarlet fever among approximately 4,270 nurses since the beginning of immunization with the number of cases among 1,335 nurses in these hospitals in the years immediately preceding immunization, shows that the incidence after immunization was less than 10 per cent. of the previous rate (18). At the Hospital for Sick Children, Toronto, most of the cases were among nurses from affiliated hospitals where immunization was less systematic. Among 1,054 nurses of the staff of the Hospital for Sick Children, one case occurred in a nurse who was Dick-negative one year before and was not retested. In the corresponding group before immunization there were 42 cases among 687 nurses. After immunization was instituted the incidence of scarlet fever was therefore 1.5 per cent. of the previous rate (19). The degree of exposure, as indicated by the number of scarlet fever patients in hospital, had not decreased, for though fewer patients contracted scarlet fever in hospital after immunization was adopted, more were admitted with this disease.

#### *Preparation of Toxin and Dosage*

Immunizing toxin is prepared by growing four standard strains, selected by the Scarlet Fever Committee, under the conditions which they recommend. The sterile broth filtrate is tested for toxicity and suitably diluted with normal saline. The toxin contains no horse protein and will not induce sensitivity to horse serum. In immunization, five doses of increasing strength are injected subcutaneously at intervals of one week. If a severe reaction follows any dose, the amount of the next dose is reduced. One month later the Dick test is done

and, if necessary, additional doses of toxin are given. In general, persons with a large reaction to the Dick test have more severe reactions to the toxin and are more difficult to render Dick-negative than those whose reaction to the Dick test is small. A small proportion of persons becoming Dick-negative become Dick-positive again in the course of the following year, and if again rendered Dick-negative by more toxin, generally remain negative. It is therefore desirable to repeat the Dick test a year after immunization.

The proportion of persons immunized and the duration of immunity depend on the total quantity of toxin injected. Against the desirability of giving a large quantity of toxin must be weighed the incidence of reactions to large doses and the inconvenience of unduly numerous doses. From 65 per cent. to 90 per cent. or more of persons receiving five doses are rendered Dick-negative, depending on the amounts of toxin in the individual doses. Persons who are Dick-positive after five inoculations of toxin may be given further doses and again Dick-tested. In this way it is possible to render Dick-negative a very high percentage of persons. Obviously no dosage is entirely satisfactory for all cases, and the dosage suitable for the majority must be modified in individual instances at the discretion of the physician.

#### *Formalinized Scarlet Fever Toxin*

Toxin modified by the addition of formalin was used in 1927 by Sparrow and Celarek (20) and later by various investigators, notably Veldee (21) and Ando and his collaborators (22, 23). The favourable reports of these on immunization with toxin modified by formalin, with or without the addition of alum, contrast sharply with the results of Dick and Dick (24), who obtained no more immunization with toxin modified by formalin than could be accounted for by the residual unmodified toxin in the material; they were also unsuccessful in precipitating toxin by the addition of alum.

At best, the preparation of toxin modified by formalin is beset with difficulties. Detoxification appears to be retarded by the nitrogen content of the solution; it is slow and incomplete, and is accompanied by loss in antigenicity; different lots vary greatly in antigenicity.

Apart from the rabbit test described by Veldee and by Ando and Nagata, the only way of estimating the antigenicity of formalinized toxin is to test its ability to immunize human beings. The results of immunization are hard to evaluate because some immunization is to be expected from the residual toxin in the material; and, in addition, many of the subjects who remain positive after receiving formalinized toxin also react positively to control skin tests with material which is atoxic. The titration of toxin and formalinized toxin by means of a flocculation test has been described recently by Rane and Wyman (25).

#### SCARLET FEVER ANTITOXIN

##### *Preparation and Testing*

In the preparation of scarlet fever antitoxin, horses are immunized with repeated and increasing doses of toxin, of living culture in agar, or a combina-

tion of the two. When a satisfactory degree of immunity is attained, the horses are bled at intervals and the plasma is collected. The globulin fraction, which contains most of the antitoxin, is precipitated from the plasma by the addition of ammonium sulphate, just as in the concentration of diphtheria and other antitoxic sera. The precipitate is redissolved and the ammonium sulphate is removed by dialysis. This process reduces the content of inert protein and concentrates the antitoxin into a smaller volume. The strength of the antitoxin is determined by its ability to neutralize toxin when toxin-antitoxin mixtures are injected intradermally. The unit of antitoxin adopted by the National Institute of Health, Washington, is the amount which neutralizes 50 skin-test doses of toxin. The protective effect of antitoxin, against fatal doses of toxin injected intravenously into rabbits, corroborates the evidence of the skin tests as to the ability of antitoxin to neutralize toxin (26).

In order to obtain an antitoxin which is effective against as wide a variety of toxins as possible, it is necessary to select suitable strains for the immunization of the horses. Some strains evoke an antitoxin which neutralizes only the strain used for immunization, while others evoke an antitoxin which neutralizes several different toxins.

Antitoxin of the strain N.Y. 5 of Dochez has been found by Wadsworth and Coffey (12) to neutralize 77 per cent. of 314 toxins; two antitoxins, prepared from other strains, each neutralized an additional 10.5 per cent. of the total number. In our experience (27), with a somewhat different technique, antitoxin of the strain N.Y. 5 neutralized 89 per cent. of 215 toxins; antitoxin of a second strain, "Smith", neutralized 8 per cent., and the remaining 3 per cent. were neutralized by a mixture of the two antitoxins. It is therefore desirable to immunize horses to such a strain or strains, as well as to strains such as N.Y. 5 or Dick strains I, II, III, and IV. It is generally recognized that concentrated antitoxin neutralizes toxin, but is not antibacterial in its effect. Although attempts have been made to produce effective polyvalent antibacterial sera, the results have, so far, not been encouraging. In view of the bewildering number of agglutinative types among the haemolytic streptococci, or even only among those found in cases of scarlet fever, the lack of success with antibacterial sera is not surprising.

### *In Prophylaxis*

Antitoxin is used to confer passive immunity on children who have been intimately exposed to scarlet fever and have not previously had the disease. The intramuscular injection of 2,000 units as soon as possible after exposure is recommended. This amount of antitoxin is insufficient to prevent the onset of the disease if given late in the incubation period; in this event a larger dose may be advisable. Owing to the rapid disappearance of any foreign serum from the circulation, passive immunity cannot be depended on to last for more than 10 days. In order to avoid the possibility of unnecessary serum reactions it is preferable, at least in adults and older children, to perform a preliminary Dick test and give antitoxin only to those with a positive reaction. The additional in-



formation given by a nose and throat swab cultured on blood agar is useful. Antitoxin should not be given to persons who are sensitive to horse serum, or if considered necessary, should be given cautiously after careful desensitization. When less intimate exposure has occurred, for instance in institutions and schools, Dick tests and, if practicable, throat swabs, followed by active immunization of the susceptible group are almost always preferable to passive immunization.

The control of scarlet fever at the Hospital for Sick Children, Toronto, has been described in detail by Dr. Beverley Hannah (19). Immunization of the staff and patients has been in progress since 1924 and has resulted in a marked reduction in the number of cases of scarlet fever developing in the hospital. The prevention of scarlet fever among patients admitted with burns is particularly interesting. These patients receive antitoxin on admission without a preliminary Dick test. Before immunization, from 1917 to 1924, among 406 cases admitted, 25 (6.15 per cent.) cases of scarlet fever developed. After immunization, from 1925 to 1933, among 680 cases admitted, 7 (1.03 per cent.) cases of scarlet fever developed. Of the 7 with scarlet fever, 5 did not receive antitoxin, and the remaining 2 received less than half the dose used at present. Since immunization was begun, scarlet fever developed in every patient with burns who failed to receive antitoxin.

#### *In Treatment*

The use of antitoxin in the treatment of cases of scarlet fever is general and continues to increase. If antitoxin is to be given, the importance of giving an adequate dose as early as possible in the course of the disease cannot be too strongly emphasized. A single large dose of antitoxin given at the outset is much more effective than the same total amount given in repeated doses over a period of several days. For mild and moderately severe cases, the intramuscular injection of 6,000 to 12,000 units, as early as possible after the onset of symptoms, is considered the minimum. In more severe cases or when treatment is begun later, much larger doses should be used. In hospital practice a total dosage of 20,000 to 60,000 units is not unusual in severe cases. The effect of a given quantity of antitoxin is much greater when administered intravenously than intramuscularly and when there is no contra-indication the intravenous administration of antitoxin may be deemed advisable in severe cases. With due precautions antitoxin may be injected intravenously without dilution; or it may be injected in combination with saline, or glucose and saline, by the continuous intravenous drip method (28). In any case it should be warmed to body temperature and injected very slowly at first. Dr. Stanley Banks has injected antitoxin intraperitoneally with results which are very similar to those obtained by the intravenous use of antitoxin. He has reported a series of cases given antitoxin intraperitoneally and has described the technique of intraperitoneal injection in detail in a recent article in the *Lancet* (29). The advantages of the intraperitoneal over the intravenous route are: the ease of injection, particularly in young patients; greater safety in treating patients sensitive to horse serum; and the lessened risk of severe thermal reactions.

*Serum Reactions*

Serum reactions following the administration of scarlet fever antitoxin appear to be no more common than following other antitoxins. The incidence and usual character of these reactions may be illustrated by the reactions observed following a series of prophylactic doses of scarlet fever antitoxin given in the medical wards at the Hospital for Sick Children, Toronto. In a series of 1,457 doses, 990 (68 per cent.) caused no reaction of any kind; 91 (6.3 per cent.) caused a thermal reaction but no serum disease and 109 (7.5 per cent.) caused a thermal reaction as well as serum disease, giving a total incidence of thermal reactions of 13.8 per cent.; 267 (18.4 per cent.) caused serum disease but no thermal reaction, and 109 (7.5 per cent.) caused a thermal reaction as well as serum disease, giving a total incidence of serum disease of 25.9 per cent. Of the 376 cases of serum disease, 112 (30 per cent.) were localized at the site of injection; of the 264 cases of generalized serum disease 54 (20.4 per cent.) were severe, giving an incidence of severe generalized serum disease of less than 4 per cent. for the whole series. It should be stated that 428 (or almost 30 per cent.) of the doses were given approximately 10 days subsequent to a previous dose; the incidence of thermal reactions and serum disease for these was practically the same as for the series as a whole. While there was a considerable variation in the incidence of reactions with different batches of antitoxin, it is of interest to note that the same batch and quantity of antitoxin given at 10-day intervals to the same patient sometimes caused serum disease or a thermal reaction, and sometimes failed to do so, irrespective of the number of previous doses or whether a reaction had occurred to a previous dose. Serious immediate reactions of an anaphylactic character are rare; according to Park (30) less than one in 20,000 doses of antitoxin administered causes a serious reaction, and not more than one in 50,000 results in death.

Before the administration of antitoxin of any kind one should inquire as to the familial and personal history of asthma and hay fever. Epinephrine and a tourniquet should be at hand for immediate use if required (31). As a test for sensitivity, the intradermal injection of a 1:10 dilution of sterile horse serum, or a 1:10 dilution of antitoxin in saline, has been recommended. An ophthalmic test using a drop of a 1:10 dilution of horse serum or of antitoxin is also employed. The application of a drop of undiluted antitoxin to a superficial scratch in the skin has been used as a convenient but less satisfactory test. While none of these tests are infallible, they are the only available means of demonstrating sensitivity to horse serum. In rare instances fatal shock has occurred in patients who failed to react to the skin test.

When it is considered necessary to administer antitoxin to a serum-sensitive patient desensitization should be attempted. No one method is suited to all cases. The first dose should not exceed 0.05 cc. subcutaneously; subsequent doses, given at half-hourly intervals, may be increased according to the patient's tolerance. If antitoxin is to be given intravenously the first intravenous dose should not exceed one-tenth of the largest preceding subcutaneous dose and should be given slowly (32).

*Value of Serum Therapy in Scarlet Fever*

Numerous papers on the effect of antitoxin therapy in scarlet fever have been published in the last few years. In some of them, such as those of Hunt (33), Lucchesi and Bowman (34), and Veldee, Stevenson and Mitchell (35), the results in a considerable number of cases treated with antitoxin and cases not treated with antitoxin are carefully compared. In spite of differences in methods, some general deductions may be drawn from the results. The least benefit from antitoxin was observed where small doses were given and where the type of scarlet fever prevalent was mild; with large doses, and where the disease was severe and toxic in character, the effect of antitoxin was more striking and even a reduction in mortality was observed. As a rule, the early administration of antitoxin caused a decrease in temperature and reduced the duration and intensity of the rash and desquamation. The incidence of complications was almost always reduced, and in some of the observed series the complications which did occur in the antitoxin-treated group were considered less severe than in the untreated group. The incidence of complications was greater in the mild cases without antitoxin than in more severe cases in which antitoxin was used. Complications already present were unaffected by the administration of antitoxin. Antitoxin was most effective if given within 24 hours of the onset of symptoms; its effectiveness decreased rapidly in proportion to the delay in administration, and after the fourth day was practically nil.

Remarkably good results have been obtained by Dr. Stanley Banks (29, 36) with the intravenous and intraperitoneal injection of antitoxin in moderate and severe cases of scarlet fever. In a series of 2,428 cases given antitoxin intravenously the average stay in hospital was reduced to 16.6 days without an increase in the incidence of secondary cases; the incidence of complications was reduced to about one-third of the incidence in the control series. There were two deaths, in patients almost moribund on admission, neither of which was attributable to antitoxin. In the control series of 1,419 receiving no antitoxin, 12 deaths occurred. In a series of 540 cases given antitoxin intraperitoneally, and compared with alternate cases given antitoxin intravenously, the results were similar. In contrast to these, cases receiving antitoxin intramuscularly showed little or no advantage over controls receiving no antitoxin; there was however, a larger proportion of mild cases among the controls.

The recent evidence indicating that the early use of antitoxin in adequate dosage reduces the incidence of septic complications in scarlet fever, combined with the knowledge that strains from non-scarlatinal infections produce neutralizable toxin, suggests that antitoxin may also be advantageously used in haemolytic streptococcus infections other than scarlet fever.

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## The Value of Decentralization in Community Health Work

**D**URING the past two decades rapid strides have been made in the advancement of preventive medicine and community health work. Aside from services relating chiefly to environmental sanitation, the modern community health program has developed activities designed to supplement the services of private physicians, and dependent for their success upon the understanding and par-

ticipation of the individual. With this development has come an increasing recognition of the value of decentralization, whether of state, county, or municipal administration, in order to bring public health work close to the people.—*Ira V. Hiscock: District Health Administration, A Study of Organization and Planning. A publication of the Milbank Memorial Fund, 1936.*

# Physical Examination of Nurses before and during Employment\*

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*Deputy Minister of Health of Alberta, Edmonton*

**I**N addition to the professional work for which nurses are responsible, they play a most important role as teachers of public health. If nurses are to teach personal hygiene and public health effectively, they must practise what they preach. The state of a nurse's health not only affects the quality of her work but has a direct bearing on her influence as a teacher. The nurse handicapped by ill health cannot radiate or teach good health. The importance of well-regulated physical exercise in maintaining a sound physique cannot be over-emphasized.

Every nurse should be given a careful physical examination before being appointed to a position on the staff and should be re-examined at intervals, depending on the nature of the duties assigned. If engaged in institutional work or in work which involves frequent contact with tuberculous patients, nurses should be examined at least once each year and also following an illness of any consequence. The physical examination should include the tuberculin test and arrangements should be made for x-ray examination of the chest. In so far as institutional nursing is concerned, it should be constantly borne in mind that the known cases of tuberculosis in the nursing of which a proper communicable disease technique is carried out are of relatively little importance as compared with the unknown and unsuspected cases to which nurses are often exposed. Investigations have shown that the incidence of tuberculosis is lower in sanatoria than in general hospitals. It has been established that negative reactors to the tuberculin test acquire tuberculosis more readily than do positive reactors. This fact should be kept in mind in the placing of such nurses.

Legislation has been enacted in Alberta and Ontario in regard to the physical examination of nurses and attendants. An Order-in-Council passed in Alberta under date of January 2, 1935, provides as follows:

"The Hospital Board shall see that every nurse in training, every attendant, and every new graduate nurse taken on the staff is given a complete physical examination, including an x-ray examination of the chest, before the nurse in training, the attendant, or the graduate nurse is accepted or placed on duty. In the case of the nurse in training and the attendant a complete physical examination including an x-ray examination of the chest

\*Part of symposium, "Personnel in Public Health Nursing", presented before the Public Health Nursing Section at the Twenty-fifth Annual Meeting of the Canadian Public Health Association, Vancouver, B.C., June, 1936. This is the second of five papers.

shall be made at least once every twelve months throughout the period of training."

In July, 1935, the Department of Health of Ontario issued regulations requiring that every nurse in a sanatorium or public hospital shall receive a tuberculin test within thirty days after entering the employ of such hospital. In all those with a positive reaction an x-ray examination of the lungs is required.

#### INCIDENCE OF TUBERCULOSIS AMONG NURSES

Definite information in regard to findings is lacking in certain of the provinces. In Saskatchewan special attention has been given to this matter. Between the years 1930 and 1933, inclusive, there were 2,281 pupil nurses in general hospitals in that Province. Of this number, 29 had to discontinue their training owing to tuberculosis, representing an incidence of 12.7 per thousand. The figures for the general population as supplied by the Saskatchewan Anti-Tuberculosis League, and as obtained by their method of case-finding, was one per thousand. The incidence among nurses was eight times that which was found among 3,376 Normal school students, mostly females, of approximately the same age-group. These Normal school students were examined by physical and radiographic methods in the same period.

In England in fifteen large hospitals in the provinces the rate is reported as 1.26 per thousand among graduate nurses and 2.39 per thousand among undergraduates (1).

Dr. George O'Hanlon, Medical Director, Medical Centre, Jersey City, N.J., recently reported (3) that:

"The average incidence of tuberculous disease among young women is about 1½ per cent.; whereas, for instance, a study of the nurses in Chicago shows that 2.2 per cent. have tuberculous disease. Heinback found that 12 per cent. of student nurses over a period of four years developed the disease. In California, Shipman and Davis found 2.6 per cent. developed disease. At the Eppendorf Hospital incidence of tuberculous disease among nurses rose to 4.6 per cent. while Ross in Manitoba found that among 800 nurses 6 per cent. developed tuberculosis during the four-year period. In our own school the percentage approximates 4½ per cent."

Attention has been given to this subject by the Committee on Research of the Canadian Hospital Council, under the chairmanship of Dr. R. T. Washburn. The following observations made by the committee on the incidence of tuberculosis among nurses and in regard to diagnosis are of interest.

1. Nurses have contracted tuberculosis as a result of being infected by patients whom they were attending.

2. The largest number of nurses contracting tuberculosis were under 25 years of age; it is rare for nurses or other persons to acquire tuberculosis after the age of 25.

3. Although the incidence of tuberculosis in the nursing profession is higher (as far as it is possible to make a comparison with girls in other walks of life



in the same age-group), the mortality is lower, due undoubtedly to more frequent examinations than in any other group of employed young women and the greater opportunity for them to receive earlier hospital or sanatorium care.

4. Patients have been found in the wards of general hospitals being treated for disabilities and having, at the same time, active pulmonary tuberculosis.

5. The known case of tuberculosis is much less dangerous than the unsuspected case.

6. X-ray examination of the chest is the most valuable method of early diagnosis.

7. The tuberculin test and the serological tests—namely, Caulfeild's inhibitive test and the complement-fixation test—are recognized as being of great value in the early diagnosis.

8. Once tuberculosis is diagnosed, sanatorium treatment is recommended.

During the past five years an important study (3) has been conducted at Bellevue Hospital, New York, into the incidence of tuberculosis among student nurses in that institution. During this period careful examination and supervision have been given to all nurses, both graduate and undergraduate, including complete physical examinations on entrance, Mantoux tests, and x-ray. Mantoux tests are repeated at intervals of six months among those who are negative and further x-ray films are made as indicated. Only eight nurses developed new tuberculous lesions during the course of training, representing a case rate of 1.09 per 100 during the year. Five of those with pulmonary or pleural lesions required treatment, or 0.95 per 100 per year. As a result of the effective measures employed, tuberculosis among nurses has been controlled so that its seriousness as a disabling and fatal disease does not appear to exceed what is to be expected among young women in other occupations in New York City. These findings indicate what can be accomplished in reducing the incidence of tuberculosis among nurses.

#### PERIODIC HEALTH EXAMINATION OF PUBLIC HEALTH NURSES

Nurses engaged in public health work should be examined by a competent physician at yearly intervals and also following an illness of any moment. Such an examination might be arranged at the time of the annual refresher course or before return to duty following the annual holiday period. While the re-examination need not be as complete as the first examination, it should be such as to give a true picture of the state of the nurse's physical and mental health. The condition of the nurse's mental health is of the first importance in work in which contact with the public is so intimate, and in which the efficiency of the service is so directly affected by the physical and mental fitness of the nurse. Before being appointed to a position on the staff, every nurse should be vaccinated against smallpox and typhoid fever, immunized against diphtheria if the Schick test indicates susceptibility to that disease, and immunized against scarlet fever if Dick-positive. We still find nurses developing one or other of these diseases in the course of their duties, sometimes with fatal results. As already mentioned, the tuber-

culin test should be made in all first examinations, if it has not previously been employed. When there is a prevalence of streptococcic throat infections in hospitals or institutions, nurses on duty should have throat cultures taken, especially during the winter months, November to March, inclusive.

The following are some of the essential points to be taken into consideration in the physical examination of nurses: age, height, weight (average and present), nutrition, condition of teeth, glands, feet with special reference to fallen arches, posture, appearance, personality; habits in regard to exercise, rest, recreation; interests, reading, et cetera; family history with special reference to tuberculosis and mental disease; personal history; previous illnesses with special reference to infections in childhood; immunity to smallpox, typhoid fever, diphtheria, scarlet fever; reaction to tuberculin test; hearing, vision, digestion, elimination, examination of the urine, menstruation; physical examination: heart, lungs including x-ray examination of the chest, abdomen, pelvis, examination of the blood including Wassermann, haemoglobin and cell count. While carrying out a careful physical and mental examination along these lines involves considerable time, information on these points cannot be overlooked if the examination is to give a true picture of the state of the nurse's physical and mental health. Careful records should, of course, be kept with space available on the record cards for notes on subsequent examinations.

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# Observations on the Training of Public Health Personnel\*

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THE necessity of adequate training for health officers, public health nurses, public health engineers, and other members of health departments is being increasingly recognized both by administrative officials of health departments and by municipalities. Definite qualifications for each office have been gradually formulated. On this continent the American Public Health Association has given serious attention to the establishment of such qualifications. Studies were initiated by the Committee on the Training of Personnel, which was succeeded in 1932 by the present Committee on Professional Health Education, now named as a permanent standing committee of the Association. Through appropriate sub-committees this committee has made recommendations concerning educational qualifications and standards for health officers, public health engineers, and nurses, and has given consideration to the status of sanitary inspectors. The training of health department statisticians and laboratory technicians has also been discussed. In the field of public health nursing the National Organization for Public Health Nursing has rendered important service. Through the United States Public Health Service, surveys and studies have been made of health services, particularly as relating to personnel requirements. Valuable assistance also has been given by the Conference of State and Provincial Health Authorities of North America in the defining of the essential qualifications of health officers.

In the great contribution which the Rockefeller Foundation has made to medical education, preventive medicine has had a highly important place. Through its leadership and munificence, schools of hygiene and other institutions have been made possible for the training of public health personnel. Encouragement also has been given to faculties of medicine to provide more adequate courses of instruction in hygiene and preventive medicine. Public health fellowships have been generously provided and these have been of the greatest value to state and provincial departments in the training of personnel.

## QUALIFICATIONS OF MEDICAL OFFICERS OF HEALTH

The health officer should be a graduate in medicine. Although in the United States there are a number of outstanding health officers whose basic training was not in medicine, there is general agreement that the office of health officer, calling as it does for the closest co-operation with the practising

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physicians of the community, can be filled best by a qualified physician. In general, the minimum requirements of special training include not less than a formal course of instruction covering one academic year in a school of public health, or other suitable courses of post-graduate study conducted under university auspices, and at least three months' field experience. These requirements imply that the administrative officer is employed on a full-time basis.

One of the very evident trends in public health administration to-day is the insistence that all members of the department should be qualified by adequate public health training. Municipalities as well as state and provincial departments are requiring of applicants for the position of medical health officer evidence of having obtained special training. It is recognized that the establishing of specific qualifications for this office, even though minimum, will result in more effective health services and will be a factor in reducing the tendency to political interference in public health appointments. The recognition of these minimum qualifications by municipal authorities will improve the status of the medical officer of health and should result in more adequate salaries for this office. An indirect but highly important result will be a further strengthening of the teaching of preventive medicine and public health in medical colleges. That this may be expected is shown by the experience of New York State, where definite requirements were introduced in 1932.

#### *The Present Situation*

To-day medical health officers are serving on a full-time basis only in cities of more than 50,000 population or in rural health units. Of the rural areas of the United States less than one-third are provided with services under the direction of full-time health officers. In Canada there are approximately 1,900 physicians in the nine provinces serving as part-time health officers. In many instances the plan is a complete failure, the municipalities receiving practically no services from their health officer. There are, of course, many exceptions where services out of all proportion to the payment received are being given. The reasons for the general failure of such a system of health administration are so well known that reference to these need not be made here. Although this system of part-time direction has such marked limitations, in Canada we are faced with the fact that it is the plan which is likely to remain in force in a very large part of the country for some years to come.

That the number of physicians receiving special training in public health to qualify them for health administration is entirely inadequate has been recognized in the United States for several years, but the greatly increased demand for trained officers occasioned by the extension of public health work through funds of the Social Security Act has created an acute situation. The latest published report of the American Public Health Association's committee records that there are twelve teaching institutions providing post-graduate courses in preventive medicine and public health in the United States and Canada, eight of which are offering special training for physicians who desire to become medical officers of health. Included in this number are three specially equipped schools of public health providing formal courses occupying at least one scholastic year. The total number of students who received either a certificate or diploma in public health or the degree of Doctor of Public

Health was 85 in 1933, 81 in 1934, and 60 in 1935. When it is remembered that many of these candidates were residents of other countries whose services were not subsequently available, it is evident that the need for an adequate number of trained officers has not been met. That recent graduates in medicine are not looking to a career in public health is due largely to the unsatisfactory position of our present health administration. Granted an adequate salary, a reasonable security of office, and freedom from political interference, the office of medical officer would be attractive to many graduates.

### *Provision for Training*

It is gratifying that in spite of the present unsatisfactory position of the office of health officer a number of thoroughly trained recent medical graduates have entered public health in the past few years. Although the Diploma in Public Health was first given in the University of Toronto in 1911, only 42 candidates received the Diploma prior to the formal organization of the School of Hygiene in 1925. Of the 105 who have received the Diploma since 1925, a recent survey showed that 100 are engaged in public health work.

A splendid demonstration of what can be accomplished is afforded in the province of Quebec. The Provincial Bureau of Health, under the leadership of Dr. Alphonse Lessard, established county health units in 1926. Year by year additional units have been created as trained personnel were available until 60 per cent. of the rural area has been provided with full-time services and 31 county units are functioning. The success of the county health unit plan in Quebec has in large measure been due to the employment of only qualified medical officers. Before establishing a unit, a most careful selection is made of a young physician who in addition to hospital training has spent one or more years in rural practice and whose appointment to direct the unit is conditional on his satisfactorily completing the course leading to a diploma or certificate in public health. Too great emphasis cannot be laid on the importance of the selection of candidates who are to undertake a formal course of instruction as provided in one of the schools of hygiene or other university course. Such factors as age, physical fitness and suitability, as well as basic training and experience, should be duly considered. An important factor in facilitating the training of public health officers, not only in Quebec but throughout Canada, has been the provision of public health fellowships by the Rockefeller Foundation and by the Connaught Laboratories, University of Toronto.

### *Short Courses of Training*

As previously stated, the situation in the United States is most urgent in this matter of obtaining properly trained personnel. As a result of the funds made available under the Social Security Act, courses of instruction are being provided temporarily in various parts of the country. In arranging for these courses the experience of Vanderbilt University was of great value. In 1928 Dr. W. S. Leathers, Professor of Hygiene and Preventive Medicine and Dean of the Medical Faculty of Vanderbilt University, recognized the need of providing training for those who were serving as directors of county health units and had not had the benefit of a formal academic course in a school of public health. To meet the need which was then evident and to-day exists in such

an emergent manner, Dr. Leathers, in co-operation with the State Department of Tennessee, undertook by the experimental method to determine the content of a suitable short course. Vanderbilt University possessed exceptional advantages for providing such a course, having for demonstration purposes the facilities of Rutherford County and several other well organized county health units. From the experiment a course of three months, divided into seven weeks' intramural instruction and five weeks of field study, was found to be practical. As a result of the demonstration of what can be accomplished in such a course, similar courses have been established during the past year in a number of centres. The combined experience gained in the conduct of these courses will have an important bearing on the question of post-graduate instruction for those medical officers of health who are already employed in the field but lack the essential basic training. In Canada, as in the United States, the demand for qualified health officers now exceeds the number of physicians with the requisite professional training in public health.

The establishing of qualifications for all municipal health officers on a state-wide basis has been successfully undertaken; for example, in New York State where, as previously mentioned, definite requirements were introduced in 1932. For all district state health officers, county health officers, and health officers of cities of more than 50,000 population, a course in public health of at least one scholastic year together with a broad experience in administration is required. As there are many practising physicians serving as health officers in the smaller communities, provision was made for special training through extension courses given by the State Department of Health in co-operation with Albany Medical School. Such courses included the assigning of readings during the year, a conference of one day each month with the district state health officer, and one week's residence in Albany. Physicians who had recently graduated and who had received an adequate undergraduate course in public health were qualified without being required to take this course. Evidence of practical experience and special training or education in public health work was also accepted. More than 80 per cent. of the health officers had met the prescribed qualifications by the end of 1934.

#### *Importance of Adequate Undergraduate Courses in Hygiene and Preventive Medicine*

The experience of New York State in setting qualifications for those health officers who are serving the smaller municipalities indicates that the graduates from colleges where adequate courses of instruction in preventive medicine are given are better able to serve as medical officers of health. This has been the experience in Canada. The recent graduates in medicine who have had the benefit of such an undergraduate course bring to the position of part-time health officer a new conception of the duties of the office and make possible a distinctly higher type of service. Already there are numerous municipalities being served by recent medical graduates who are taking very seriously their appointment as a part-time health officer. The effect of the improved training of undergraduate students in the field of preventive medicine is reflected also in the interest of the younger physicians in the work of the local health department as evidenced by their willingness to assist the health officer in his pro-



gram. Frequently the younger physicians in the community have been an important factor in stimulating the health department to undertake a wider program. These two factors may serve to strengthen the existing plan of part-time health services and lead ultimately to full-time organizations. It is recognized, of course, that adequate health services in the smaller urban municipalities and in rural areas can be furnished only by a co-operative plan permitting of full-time administration by a competent, well-trained physician with special public health training.

The Rockefeller Foundation has given leadership to the movement for the more adequate instruction of undergraduate medical students in hygiene and preventive medicine. Valuable services have been rendered also by the committee of the American Public Health Association. An important fact-finding survey of medical teaching was conducted in 1935 by Dr. H. G. Weiskotten on behalf of the Association of American Medical Colleges and the Council on Medical Education and Hospitals of the American Medical Association. In each of the faculties of medicine visited detailed information was obtained regarding the formal instruction in this subject and the extent to which preventive medicine was incorporated into the instruction given by other departments. In 1935 also, funds were made available through the Rockefeller Foundation to permit of visits being made by representatives of the leading medical schools to the departments of preventive medicine of selected colleges. Advantage was taken of this opportunity by many colleges and the exchange of ideas and methods of presentation of material was most profitable. A further intensive study of the teaching of preventive medicine not only on this continent but in Europe is now being undertaken under the auspices of the Rockefeller Foundation by Dr. J. G. FitzGerald of the University of Toronto, assisted by Dr. C. E. Smith of Leland Stanford University.

#### *Value of Annual Conferences, Scientific Journals, and Bulletins*

Certain states and provinces require that the medical officer of health shall attend an annual conference called by the Department of Health. Such conferences offer the possibility of being modified into short courses of instruction replacing the usual presentation of papers. The publication of selected papers and suitable articles in state and provincial bulletins is appreciated by health officers. The value of the monthly scientific journals in public health as published by such bodies as the Society of Medical Officers of Health of Great Britain and by the American and Canadian Public Health Associations needs no emphasis. Through the co-operation and support of the Provincial Departments of Health the Canadian Public Health Association has been enabled to publish a suitable journal and to have it made available to every health officer in Canada.

#### QUALIFICATIONS OF PUBLIC HEALTH NURSES

There are in the United States and Canada more than 20,000 public health nurses serving under official and voluntary agencies. During the past twenty years post-graduate instruction in public health nursing has been provided in numerous centres. Trained public health nurses, however, constitute only a

relatively small proportion of those who are engaged in this field. The several important surveys which have been made concerning public health nursing in the United States and Canada have revealed not only the need for a wide extension of public health nursing services but the necessity of the proper training of those undertaking such duties. The very large group of nurses who are engaged in public health work and who lack basic training presents a serious problem. Experiments have been made in the provision of suitable short courses. The continuous training afforded through well-trained nursing supervisors is a valuable contribution. The establishing of minimum qualifications will be an important factor in the future in reducing this problem. That such a large percentage of public health nurses are without the necessary training in public health is not surprising in view of the large demand which has been made for such nursing services and the additional year of training required.

To-day the whole subject of nursing education is being reconsidered in the light of the new demands made on nurses. As early as 1921 the first study of public health nursing education, undertaken by the League of Nursing Education, revealed the weaknesses of the basic training obtained in hospital nursing schools. Subsequent reports to the advisory body known as the Grading Committee revealed the low level of general education, the inadequacy of the teaching facilities, and the limitations of such training.

To provide special training in public health nursing, courses for graduate nurses have been given in many centres. The practical value of these courses has been evident but their limitations have been clearly recognized. A basic criticism is that such courses are an attempt to superimpose a post-graduate course in public health nursing on an inadequate preliminary nursing training. Another approach to the question of adequate training has been the plan of preparing nurses specifically for public health nursing service by arranging a university course in nursing occupying four or five years. Such nurses are awarded a university degree in nursing and are qualified to undertake public health nursing. A number of universities have provided such courses but it is not yet possible to assess the value of this type of training.

An experiment of special interest in connection with the fundamental considerations of public health nursing training is the work of the School of Nursing, University of Toronto, which was organized in 1933 under the direction of Miss Kathleen E. Russell, B.A., B.Paed. The study which is being conducted centres in the effort to determine the basic content common to the needs of all nursing practice and is therefore an experiment in the general training of nurses. The establishing of the School was made possible through the co-operation of the Rockefeller Foundation, the University of Toronto, and the teaching hospitals of the city.

Like similar institutions in a number of European countries, the School of Nursing functions primarily as a school. In teaching-hospitals, on the other hand, pupil nurses supply the greater part of the nursing service and instruction in the various essential subjects is given as time permits. It is the purpose of the School to provide general training in nursing which will include preparation for both hospital nursing and public health nursing; in other words, to integrate public health nursing into a basic curriculum so that on

completing the course of training the nurse is prepared for public health work as well as qualified for bedside nursing.

This new undergraduate course in public health nursing occupies thirty-eight months. Only one class is enrolled each year and the yearly enrolment is limited to ten students. The class enters late in September and the students must live in residence throughout, with the exception of a few months. Senior matriculation (obtained after five years' high school) is the minimum academic requirement and nineteen years the minimum age requirement. The two aspects of the preparation, curative and preventive, are interwoven throughout the course. At the end of the course the successful student receives a double qualification: she is eligible for registration as a graduate nurse and is qualified for public health work. A diploma stating that the nurse is qualified in nursing and in public health is awarded. The first class to complete this three-year course graduated in October, 1936.

The lessons to be learned from this attempt to combine basic training in public health with an adequate nursing experience within the period of three years usually given to undergraduate nursing instruction will be of great value. As stated by Miss Russell in a recent reference to the work of the School, "This work is purely experimental; no claim is being asserted beyond the need to find out what can and should be done."

#### QUALIFICATIONS OF SANITATION PERSONNEL

The committee of the American Public Health Association, with the United States Public Health Service, has recommended provisional standards under the titles public health engineer, sanitarian, and sanitary officer. The term "sanitarian" is suggested for those with college training who have received in addition one year of post-graduate instruction in sanitation, to distinguish such officers from those who can qualify only as sanitary inspectors.

The place of the public health engineer in health services, the qualifications for his office, and the type of specialized training have been well defined. His field of work includes not only sanitation as related to water and sewage but ventilation, air conditioning, lighting, control of dust, and the supervision of all engineering procedures involved in the distribution of safe milk and other food products. Post-graduate courses for engineers have been provided in several universities in the United States and in the University of Toronto.

In Canada every municipality is required to appoint a sanitary inspector. The sanitary officer or inspector occupies a position which varies widely in its responsibilities and is filled in many instances by persons with no special training. Frequently the major portion of the inspector's time is occupied with other duties assigned to him by the municipality and having no relation to the Department of Health. In cities the situation is more satisfactory and in a number of instances all the inspectors are holders of the certificate of the Royal Sanitary Institute of London or other acceptable qualification. Attempts to meet the situation in some municipalities have led to the assumption of the greater part of the inspector's duties by public health nurses. It is the con-

sensus, however, that the well-trained sanitary inspector is an essential member of the health organization. The service which can be rendered by a well-trained veterinarian in food control is fully recognized. There are, however, only a small number of veterinarians with suitable training at present engaged in public health work.

The committee of the American Public Health Association has not been able to set standards for sanitary inspectors but has urged that facilities should be provided by which supplementary education in health work equivalent to two years of college work may be obtained. They have recommended as preliminary education requirements graduation from high school or its equivalent. Efforts have been made by several state departments to provide training courses for sanitary officers. In this connection the courses of instruction which have been given since 1930 in the Los Angeles County Health Department under the direction of Mr. Walter S. Mangold are of special interest. To meet the urgent need for trained sanitary officers, it was possible to offer, through the co-operation of Stanford University and the University of California, in the newly created Western School of Public Health, a course of eight weeks' intramural instruction and four weeks of field practice. In Tennessee and in New Jersey courses of instruction have also been given. In Great Britain the place of the sanitary inspector is definitely established and only qualified inspectors may receive appointment. Certificates of proficiency are issued on the completion of approved courses by the Royal Sanitary Institute and Sanitary Inspectors' Examination Joint Board.

With the approval of the federal and provincial departments of health the Canadian Public Health Association undertook in 1933 to establish standards, conduct examinations, and issue certificates of proficiency. The educational standard established by the committee is the completion of an acceptable secondary school education. Candidates who are already engaged in sanitary inspection but cannot meet this requirement are being permitted to take the examinations until 1938. The examinations, which are held simultaneously in provincial centres, consist of the preparation of a field report, an oral examination, and three written papers in sanitation, food control, and control of communicable diseases. They are being held yearly and the third examinations will be held in September, 1937. Applications for the 1936 examinations were received from fifty candidates, of whom forty-two were permitted to sit and thirty-seven were successful. The committee of the Canadian Public Health Association has not assumed responsibility for providing training facilities but has issued a syllabus and a list of suitable readings. To meet the need for training, at least five of the leading cities have arranged courses of instruction provided by members of their staff. The committee has in preparation a mimeographed outline presenting the essential knowledge required of the candidate to serve as a guide in his reading. General approval has been expressed and the Association believes that a forward step has been taken in this attempt to improve the status of the sanitary inspector in Canada.

# The Need for Uniformity in Tuberculosis Records and Statistics\*

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WHEN the Canadian Tuberculosis Association was formed in 1900, one of the duties of the Association was the investigation of the prevalence of tuberculosis in Canada, with the collection and publication of such essential information. Although many of the early objectives of the Association have been attained and the obligations discharged, I feel that this duty of gathering statistical information has not been adequately met.

The collection of national statistics is a relatively recent development in Canada. Although the Dominion Bureau of Statistics did not assume responsibilities in the collection and tabulation of vital statistics for the provinces until 1921, substantial progress has been made, including the establishment of a Canadian registration area embracing the nine provinces. Valuable tabulations have been published by the Dominion Bureau and studies of the mortality records have been made for the provincial departments of health. Although the mortality data as relating to tuberculosis can now be considered much more accurate, through the separation of tuberculosis in the white and Indian populations, the reporting of cases is unsatisfactory and morbidity data are practically unavailable. It is not possible, therefore, to supply much of the essential information which is needed in planning and conducting an intelligent and scientific program for the prevention of tuberculosis.

That Canada does not stand alone in its failure to supply detailed information is evidenced by the fact that each year the International Union against Tuberculosis sends to its members forms outlining only the main features of the problem, and it is remarkable how much information is lacking in the published reports. Though this may be a consolation for us, we should not allow it to paralyze our efforts for the improvement of our own statistics or blind us to the need.

## THE NEED FOR MORE COMPLETE DATA

The matter of more complete statistical information has received attention from time to time, both from our national association and from the separate units through which it works, but difficulties have seemed insurmountable and the problem has remained untouched. Perhaps there has been reason for this. In the past, there has been the tendency to do that which lay nearest to our hand, both because of the obviousness of that particular need

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and because the operation of any single therapeutic or preventive measure had a beneficial effect in reducing the amount of tuberculosis. However, to-day emphasis is changing and the problem needs to be more clearly defined. In most provinces the obvious and near-at-hand things have been done and it now remains to evaluate these, seek new angles from which to attack the problem, try these and again evaluate the results. This can be done only if detailed statistics are kept by individual institutions and associations, and reports are made by them based on this information. It should be the duty of our national association to correlate these reports and to make them available in suitable form, but its hands are tied until the local organizations provide the local information.

Canada's tuberculosis work ranks second to none in comparison with other countries as shown by the information on hand. It is therefore to be regretted that the comparative values of this work are not available in detailed form. It is a matter for apology that, for Canadian use at any rate, more Canadian statistics are not used rather than those of other countries, which is the rule to-day. Not that we would deprecate in any way availing ourselves of the information from outside Canada, for to research work in other countries we owe a debt of gratitude which we all are glad to acknowledge, but, surely, in speaking to Canadian audiences it would be more pertinent to use our own statistics than to quote, for example, the extent of disease found in Great Britain or the United States, figures for which are not always comparable for this country. The work is being done in Canada, and if proper records permitting of comparison were kept, reliable information would be available. This information would allow us to give to the Canadian public and to the professional groups clear pictures of what has been done, what remains to be done, and how best to do it.

#### THE NEED FOR SPECIFIC INFORMATION

Typical of the need for specific information is the lack of data concerning the incidence of infection according to age-groups, occupations, and racial origins. This information could be made available for Canada if the local organizations, all of which have done so much along these lines, would report to the national association their findings in full.

Possibly the most urgent need, however, of providing "made in Canada" statistics, is that of supplying justification for intensive work in the more highly specialized fields. As I have intimated, in the early days of the tuberculosis campaign the tuberculosis problem could be attacked from any angle and good results would follow. To-day, in order to get the best returns for our efforts and money, we must concentrate on specific phases of the problem. It has been aptly said that the days of the shotgun method of attack have passed and to-day we must substitute the rifle and carefully choose our targets.

Tuberculosis is a complex problem and many factors have a contributing influence. What are the most important of these factors is not always so



evident. Are they racial, industrial, or economic and to what extent do they vary and are susceptible of being influenced? Assembling detailed reports on every phase of tuberculosis in Canada and intensive study of these reports would undoubtedly supply some answers.

#### *Racial Origins*

The high incidence of the disease in the Indian and Oriental populations in Canada has been recognized and studied. Our statistics should tell us the incidence of tuberculosis in other races and provide us with a basis for comparison and a clue to the line of action for dealing with the disease among our foreign-born population.

#### *Occupation*

The problem of tuberculosis in industry is receiving increasing attention and it is closely linked with economic conditions. Statistics for the United States show that the incidence of tuberculosis can be definitely correlated with economic status. Similar statistics should be available for Canada to provide specific direction to our efforts.

### THE NEED FOR UNIFORMITY IN CLINICAL TERMS

There is no uniformity in clinical reports, and in consequence, statistical data of value cannot be compiled. Some institutions classify cases only as "minimal", "moderately advanced", and "far advanced"; others include a "hopeless" group, while others record various sub-classifications such as "childhood" tuberculosis. We have conflicting reports, too, as to progress made in the early diagnosis of tuberculosis. In the matter of "admissions", there is a similar lack of uniformity in definition. "Admissions" should be separated into "new" cases and "re-admissions". In some institutions, "admissions" are for a short period of observation. This fact should be stated. Some institutions exclude from the "re-admission" class those treated less than thirty days; others exclude those treated less than six weeks. Obviously these discrepancies will have to be removed, for at present it is impossible to compare accurately different provinces or even regions within a province.

#### *Bacillary Cases*

The number of those treated who were bacillary on admission is important, as is the number of bacillary cases discharged. Many of the reports we receive do not mention either classification. It is recognized that in evaluating results, it is necessary to know the proportion of bacillary cases which become negative during their stay at the sanatorium, for this gives a fair index of the effectiveness of the treatment given. It is also recognized that it is equally important to know the number of patients who return home still bacillary, for it is this group which should receive the most careful attention in the way of after-care and home supervision.

This classification of the bacillary cases is also important in that it leads to a more careful checking up on the non-bacillary cases receiving treatment and the discharge as early as possible of those who are no longer in need of sanatorium treatment; not that it is the criterion on which discharge is based, but when beds are at a premium it is an important one. Though in most of the provinces we are still in need of beds for the tuberculous, yet the number of non-tuberculous patient-days given by sanatoria is in some cases astonishing. The situation challenges closer consideration and action. While no objection would be raised to the treatment of non-tuberculous cases if there were empty beds, yet where waiting lists exist and general hospitals are operating at only 60 per cent. of capacity, one might be permitted legitimate doubts as to the wisdom of the practice. The same point should be raised in considering the number of days of treatment given that class of patient classified as "observation" and "undiagnosed". While a reasonable period of observation is in some cases necessary, it can, and often should, be reduced. It is a challenge to the medical staffs of the various institutions to improve their facilities for diagnosis and so reduce the number of non-tuberculous and observation treatment-days given by the sanatoria.

#### *Non-pulmonary Tuberculosis*

The extent to which non-pulmonary tuberculosis is treated in tuberculosis institutions varies, but it would seem that the treatment of such cases is coming more and more into the work of the sanatoria. In some provinces it constitutes as much as twenty per cent. of the treatment-days given. Since the length of treatment necessary for non-pulmonary cases is often longer than for pulmonary cases, the figures of an institution which treats and another which does not treat such cases are hardly comparable. In determining the number of beds necessary for open pulmonary cases, it is therefore highly desirable that institutions classify each type of case separately.

### OTHER NEEDS

#### *Data on Delay in Hospitalization*

Another valuable adjunct in directing our strategy and rifle-fire would be detailed information on the delay that exists between the time of the diagnosis of the patient and the date of his admission for treatment. This varies greatly in the different provinces and with sufficient data it would be helpful to note the improvement from year to year and its probable effect on the waiting lists. Information concerning delay in hospitalization would permit of the judging of the efficiency of plans for financing treatment. Financing treatment is responsible largely for the delay in instituting treatment.

#### *Study of Re-admissions*

Much could be learned from a study of "re-admissions". For instance, the number of re-admissions necessary each year is an excellent indication of the efficacy of the treatment given, the health education of the family and

the community, and the follow-up work of the institution. A study of re-admissions would give also a clue to the acuteness of the problem of convalescent treatment and the need for a program of sheltered employment or the rehabilitation of ex-patients. With the present inadequacy of the reports received from institutions, it is impossible to assemble sufficient accurate information as required by any student of the problem before conclusions can be drawn. The conviction to-day is that if we are to protect the original investment made in restoring people to health, it is necessary to consider projects which will help to keep them well. Convalescent treatment and rehabilitation are problems that are becoming more and more urgent.

### *Collapse-Therapy*

The extent to which the various measures of collapse-therapy are used needs further study and consideration. For instance, the use of pneumothorax seems to vary greatly, fifteen per cent. of patients receiving this treatment in some institutions, while more than forty per cent. receive it in others. The use of such surgical procedures as thoracoplasty varies even more. Since these modern methods are available, it behooves us to use them to the extent that it is wise to do so and, through tabulated reports of the results obtained, establish the question of their value.

### *Patients Leaving Sanatoria Against Advice*

The problem of patients who are discharged against medical advice, particularly those who are bacillary, is an important one. The percentage of patients who complete their treatment is an indication of the ability of any institution to give satisfactory treatment and so protect the community. It is wasteful financially, looking at one side only of the situation, to treat patients for a month or two, only to have them leave the institution against advice and return later as a definite menace to the family and the community.

### *Extent of Clinics*

Another phase of the tuberculosis problem in which a tremendous amount of work has been done and on which only the most meagre information is available is the subject of clinics. Clinics have made a most important contribution to the solution of the tuberculosis problem in Canada. In 1935 more than 160,000 people were examined, but little of the information obtained is generally available. In many instances we have no information how the large numbers reported are grouped as to new cases, re-examinations, and ex-patients reviewed. This is a distinct loss, for from such information we should be able to make deductions and lay down general rules for the conservation of our efforts in some groups and their intensification in others. Again, the rifle-fire is desired rather than the use of the shot-gun. For instance, in some clinics the greater part of the time seems to be spent on the examination and re-examination of contacts. Many of these are between the ages of five and fifteen and they return to the clinic at various intervals

to be checked and re-checked. Since this is the group least likely to have tuberculosis, if contact has been successfully broken, it is possible that this group may be receiving unnecessary supervision and the work should be concentrated on more susceptible groups. The time and money saved might be devoted to some other salient feature of the program.

### *Importance of Morbidity Rates*

Again, it is a question whether in the past we have laid too much emphasis on mortality rates and too little on morbidity rates in the same classes and age-groups. We surmise that the morbidity rates fairly parallel the mortality rates, but do we *know*? It would be answered by a relatively simple calculation from information which is easily available. Not only would it be easily made, but it might have considerable influence on the direction of our efforts along more promising lines of attack—an example of the more judicious selection of our targets.

### WHAT IS BEING DONE TO MEET THE NEED

The foregoing remarks have been based on suggestions received from tuberculosis workers from all sections of Canada, and therefore express a widely felt need. At a meeting of our executive a year ago, the suggestion was made that something should be done to improve the situation. The Dominion Bureau of Statistics had been considering the problem and offered to co-operate. As a result of the joint effort, suitable forms were discussed and admission and discharge cards were prepared. These forms were distributed to some forty tuberculosis institutions for comment and valuable suggestions and criticisms were received. By the use of these cards, information concerning each patient will be made available and, if received from the institutions, will constitute the most valuable data. In preparing these forms for sanatoria and clinics, a survey was made of the information which is being published in Canada and other countries.

### *Admission Card*

A card eight by five inches provides for the following essential information concerning each admission: name, address, date of admission, age on admission, sex, conjugal condition, and number of familial contacts. Space is provided for specific information concerning citizenship; racial origin; birth-place of patient, father, and mother; and year of arrival in Canada, together with information concerning occupation, industry, and religion. The card states whether the admission is a new case, a case for review, or a re-admission. Clinical data are supplied under the headings: pulmonary, non-pulmonary, non-tuberculosis, and undiagnosed. Under pulmonary tuberculosis mention is made as to whether bacillary or non-bacillary. Provision is made for a notation regarding childhood type (parenchymal, tracheo-bronchial, or combined), adult type (minimal, moderately advanced, far advanced), and pleurisy (with or without effusion). Data relative to the duration of the

present illness before diagnosis and from diagnosis to admission are also requested.

### *Discharge Card*

Such essential data as date of discharge, age on discharge, and whether discharged on medical advice or against medical advice, are presented, together with information concerning length of treatment in sanatorium and length of treatment during previous admissions. The need for information concerning the nature of the treatment given was recognized, and from the card it can be determined if medical treatment only was given or if a pneumothorax or other surgical procedure formed part of the treatment. Space is provided for additional information concerning treatment. A satisfactory answer can be obtained concerning the condition of the patient on discharge. The data requested are arranged under four headings: pulmonary, non-pulmonary tuberculosis, non-tuberculosis, and undiagnosed. The classification suggested includes arrested, apparently arrested, quiescent, improved, unimproved, and fatal. In the latter four classifications additional information is asked as to whether bacillary or non-bacillary. Data concerning complications, tuberculous and non-tuberculous, are required, and if the case resulted fatally the medical statement of the cause of death is given. Information is desired also concerning home conditions; relationship of patient to contact; and if the contact was ascertained, whether a pulmonary case (bacillary or non-bacillary), non-pulmonary, bovine, or unknown.

Increasing attention is being given to the collection of tuberculosis statistics in the various provinces. In Ontario consideration is being given to the preparation of essential forms. Recently, British Columbia made a comprehensive and valuable compilation of tuberculosis statistics for that province, and has published it in a form which makes the data readily accessible. To provide statistics for Canada which can be referred to with a reasonable degree of confidence, tuberculosis workers across the Dominion must unite in the effort and co-operate fully in supplying the necessary detailed information. There must be an agreement on standards and the preparation of suitable record forms. The progress already made is a good promise for the future.

# A Water-borne Outbreak of Paratyphoid A Fever

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**T**HIRTY-SEVEN cases of paratyphoid A occurred among a population of 133 in the fall of 1932 at Vindex, Garrett County, Maryland, a coal mining settlement owned by one of the large mining companies. The cases occurred among the families occupying one section of the settlement known as "Six Foot Row", a series of 26 houses owned by the coal company. In addition to the 37 cases which occurred among the population of 133 there were 4 cases among non-residents who contracted the disease while on a visit to the community.

Identification of the causative organism was made by blood cultures, agglutination tests of sera, and the isolation of *B. paratyphosus A* from stool and urine specimens. The source of infection was traced to the local water supply contaminated by drainage from an outdoor privy into which had been thrown the discharges of a patient who, on account of illness which was undiagnosed, had returned to her home from a visit to an adjoining state. The outbreak was first brought to the attention of the health officer on September 8, 1932. The dates of onset of the paratyphoid A infection extended from July 11 to October 3, 1932.

Investigation revealed that 11 cases of dysentery also had occurred among the inhabitants of "Six Foot Row" in June, 1932, and subsequent investigation showed that a total of 27 cases of dysentery had occurred in 20 of the homes in "Six Foot Row" immediately preceding the outbreak of paratyphoid. It is interesting to note that an outbreak of diarrhoea preceded an epidemic of paratyphoid A recorded by Berry (1) in 1916 among the troops encamped on the Mexican border. Of 1,000 men, approximately one-third contracted the infection.

## INVESTIGATION

The settlement at Vindex is about half a mile above the main quarters for the employees of the coal company and extends along the road over a distance of about a quarter of a mile. The houses are the usual frame type found in the mining camps of this section, without running water and with ordinary open dirt pit privies as a method of sewage disposal. These privies

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are located on the hillside about forty feet above the houses with the ground sloping towards the road below the houses. There is also a general slope of the ground from the houses at the upper end of the row toward the well located between houses 11 and 12 (figure 1).

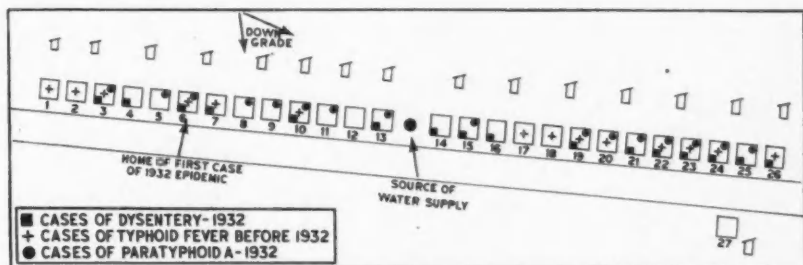


FIGURE I

Cases of dysentery in 1932, typhoid fever before 1932, and paratyphoid A in 1932.

A house-to-house canvass showed the population of "Six Foot Row" to be 133, all white. The adult males were all employees of the coal company. The sanitary and economic status were rated as poor in 5 of the 16 homes in which the infection occurred, as fair in 8 of the homes, and as good in 3 homes. Overcrowding and lack of fly screens were found in 9 homes. Three homes having a total of 14 cases were overcrowded and not screened. Outdoor privies were in general use, one double privy serving for each two houses. In no instance were the privies protected against flies.

The regular water supply for the 26 houses was obtained almost entirely from the well shown in the figure. This was a surface "dug" well 4 by 6 feet in diameter and 15 feet deep. It was not protected from surface drainage, although it was impossible for drainage to flow over the surface to the well from house no. 6, where the original cases of paratyphoid A infection occurred. The bacteriological examination of water from the well had in previous years shown the presence of *B. coli*. On September 11th a small amount of uranin was placed in the privy vault used by the occupants of the house where the first case occurred. Within 48 hours the dye colour was detected in a sample of the well water. On November 22nd and 25th the chloride content of the well water was found to be 18 and 14, respectively. On November 25th sodium chloride was placed in the privy vault of house no. 6. Samples of the well water taken within a few hours showed no increase of chlorides. Samples taken a few hours later showed the chloride content to be 58; on November 27th, 38; and on November 28th, 22.

There was no common food supply for the patients or for the community. There were no picnics or gatherings preceding the outbreak. The milk supply for 22 of the cases came from 6 different sources. Nine cases used canned milk and 6 used no milk. One milk distributor who had had 5 cases of typhoid fever in his home in 1926 supplied 2 families (13 persons), among whom 5 cases of paratyphoid A occurred in 1932. Ice cream was not used in the community.

## PARATYPHOID A

Paratyphoid A infection was first diagnosed on September 22, 1932, when a positive blood culture was obtained from a patient who had first been taken ill on September 13th. Agglutination tests of some cases were positive in dilutions as high as 1-1280. Six stool and urine specimens were obtained and found positive for *B. paratyphosus A*. Confirmation of *B. paratyphosus A* as the infecting organism was made by absorption tests.

Investigation revealed that the first case occurred in home no. 6 (see figure 1), where this case gave a history of "dysentery" since July 11, 1932, while away from home. She returned to "Six Foot Row" on July 18th. However, she had made a short visit to her home during the time dysentery prevailed. The onset of the second case was August 1st, or 15 days after the return of the first case. During the period July 11th to 20th 1 case occurred; from July 21st to 30th no cases were reported; from July 31st to August 9th, 1 case; from August 10th to 19th, 4 cases; from August 20th to 29th, 12 cases; from August 30th to September 8th, 16 cases; and from September 9th to September 18th, 3 cases.

Four cases of paratyphoid occurred among visitors to homes in which cases existed. Two of these cases were males, miners by occupation, and were 27 and 57 years of age; one was a female, by occupation a housewife, aged 29; and her son, aged 9 years, who developed the disease 3 weeks after his mother's return to the home.

A history of previous typhoid fever was obtained in 14 of 26 homes. The year in which the disease occurred, the number attacked, the home census (1932), and the number of cases of paratyphoid A in 1932 are shown in table I. In the 14 homes giving a history of 1 or more cases of typhoid fever previous to 1932, all had contracted their infection of typhoid previous to residing at "Six Foot Row". All had lived at "Six Foot Row" from 7 months to 2 years previous to the 1932 outbreak, with the exception of the family in house no. 6, in which the first cases in this outbreak occurred; they had lived there for only 2 months and 14 days. Of 27 cases of dysentery which occurred in 1932, 10 or 37 per cent. later developed paratyphoid fever. The occurrence of dysentery and paratyphoid A, with history of previous typhoid, is presented in table I.

*Clinical Characteristics*

Fidler (2) recorded the clinical manifestations of the disease with the gradual onset, headache, weariness, loss of appetite, and general weakness; aches and pains, mild bronchitis, tenderness in the right lower quadrant, rose spots, and typical typhoid facies. During the early stage the disease resembled true typhoid. The temperature showed a sudden rise during the first 7 days, 104° to 105° F., with frequent distinct chills. There was a gradual decline of temperature and convalescence was fairly rapid.

Six cases were of a mild type, the duration of the illness extending over a period of 7 days. Twenty cases were of moderate severity, the prodromal

symptoms lasting from 7 to 10 days, followed by onset of fever of 104° to 105° F. Severe chills, malaise, severe headache, nose bleed, rose spots, loss of appetite, bronchitis, flatulence, nausea and diarrhoea were recorded. The duration was 14 days to 3 weeks, the convalescence was rapid, and complete recovery was made without complications.

TABLE I

OCCURRENCE OF DYSENTERY AND PARATYPHOID A WITH HISTORY OF PREVIOUS TYPHOID

Home	No. of persons	Cases of dysentery Before		Typhoid before 1932		Para-typhoid A 1932	Length of residence in home to date of epidemic (July, 1932)
		1932	1932	Cases	Year		
1	4	..	..	1	1921	..	9 months
2	6	..	..	1	1914	..	1 year, 6 months
3	4	..	3	1	1912	3	1 year
4	6	..	2	..	....	..	2 years
5	3	..	..	..	....	1	?
6	9	..	1	2	1912	2	2 months, 14 days
7	4	..	1	1	1923	..	3 months
8	7	..	..	..	....	2	2 years
9	2	..	..	..	....	1	2 years
10	3	..	3	1	1906	2	7 months
11	4	2	..	..	....	2	8 years, 6 months
12	5	3	..	..	....	..	2 years, 3 months
13	8	4	1	..	....	4	2 years, 1 month
14	3	..	1	..	....	..	2 years, 3 months
15	3	..	1	..	....	1	1 year, 6 months
16	3	3	3	..	....	..	2 years, 4 months
17	2	2	..	1	1918	..	1 year, 6 months
18	4	..	..	2	1893	..	1 year, 6 months
19	6	3	2	2	1911-12	1	2 years, 2 months
20	9	..	..	1	1910	4	1 year, 1 month
21	4	3	3	..	....	1	1 year, 9 months
22	5	..	1	1	1894	2	1 year, 6 months
23	10	7	1	1	1904	5	1 year, 8 months
24	3	..	1	1	1902	1	2 years, 2 months
25	10	7	1	..	....	5	2 years, 3 months
26	7	..	2	5	1926	..	2 years, 2 months

Fifteen cases were severe, the general onset lasting from 7 to 10 days, with headache, general malaise, diarrhoea and chilliness. Nose bleed and severe chills occurred almost nightly, continuing through the entire period of the disease. Chills would occur 3 times a day, with profuse perspiration followed by elevation of temperature, severe bronchial cough, rose spots, prostration and stupor. One death occurred during the epidemic in the group of associated cases—a male, aged 57 years.

#### *Sex, Age, and Attack Rates*

Nineteen of the 37 cases were males and 18 were females. Fifteen were coal miners; 10 were housewives; 10 were school children; and 2 were pre-school children. The age, sex and attack rates for the total population of 133 are shown in table II.

TABLE II  
PARATYPHOID A—ATTACK RATES, AGE AND SEX  
For Total Population

Ages	Total Males	Male Cases	Attack Rate %	Total Females	Female Cases	Attack Rate %	Total Census	Total Cases	Attack Rate %
0- 4	14	1	7.	6	1	17.	20	2	10.
5- 9	10	1	10.	12	2	17.	22	3	14.
10-19	11	4	36.	18	5	28.	29	9	31.
20-40	21	9	43.	20	8	40.	41	17	41.
40 & over	11	4	36.	10	2	20.	21	6	29.
Totals	67	19	28.	66	18	27.	133	37	28.

Calculation of the attack rates for the population of the homes in which paratyphoid fever occurred showed a rate of 41.3 for males, 19 cases occurring among the male population of 46, and a female attack rate of 41.8, 18 cases occurring among the 43 females.

The primary and secondary attack rates in the 16 homes in which one or more cases occurred are presented in table III. The case with the earliest

TABLE III  
PRIMARY AND SECONDARY ATTACK RATES IN HOMES WITH PARATYPHOID A

Ages	Primary Cases	Home Census	Primary Attack Rate %	Home Census less Primary Case	Secondary Cases	Secondary Attack Rate %
0- 4	2	13	15.	11	0	0.
5- 9	3	14	21.	11	0	0.
10-19	7	22	32.	15	4	27.
20-40	13	36	36.	23	6	26.
40 & over	2	4	50.	2	0	0.
Total	27	89	30.	62	10	16.

date of onset was taken as the primary case. The secondary attack is shown to be in the age-groups 10 to 19 years and 20 to 40 years. The secondary attack rate is lower than the primary attack rate. In McGinnes' (3) series of diarrhoea and dysentery the largest per cent. of secondary cases occurred in the younger age-groups. The age distribution of the secondary cases did not differ significantly from the age distribution of primary cases, either as a whole or in the homes with multiple cases.

In the whole population of 133, 21 gave a history of previous typhoid, leaving 112 without a history of previous typhoid. Three cases of paratyphoid A occurred in the 21 with a history of previous typhoid, a rate of 14 per cent. Thirty-four cases occurred in the 112 with a history of no previous

typhoid, a rate of 30 per cent. The numbers, however, are far too small to establish a difference in susceptibility to paratyphoid A.

#### Control Measures

As soon as the disease was reported to the health officer, the community well was closed and a new water supply established. All privies were put in a sanitary condition, nursing services for the sick were provided, concurrent disinfection was instituted, and those not already ill were given immunization.

#### CONCLUSIONS

An outbreak of 37 cases of paratyphoid A among a resident population of 133 persons, with 4 cases among visitors to the community, occurred in a mining hamlet.

The epidemic was preceded by an outbreak of dysentery (27 cases). Ten of these patients subsequently developed paratyphoid A infection.

The infection was traced to a resident who returned to her home after a visit suffering from an undiagnosed disease.

Pollution of the common well serving this community by seepage from the privy of the home of the first case was shown to exist by the use of uranin and salt test. Infection of the common well was the probable cause of the outbreak. The well water was the only common factor.

*B. paratyphosus A* was isolated and identified as the causative agent.

#### ACKNOWLEDGMENT

Identification of the causative organism as *B. paratyphosus A* was made by W. A. Gunther, bacteriologist, Allegany County Health Department, and confirmed by C. A. Perry, D.Sc., Chief, Bureau of Bacteriology, Maryland State Department of Health, and C. P. Eliot, D.Sc., Department of Bacteriology, Johns Hopkins School of Hygiene and Public Health.

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# The Adrenal Glands: A Review of Laboratory and Clinical Studies\*

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## PART I: The Adrenal Medulla†

**I**N all species of animals hitherto investigated, the total removal of adrenal tissue results in death. The reasons for this result have been investigated extensively during the past ten years and, although the problem is by no means completely solved, research has shed sufficient light on the function of these glands to justify a review of the progress in this field.

For an organ which obviously plays such an important part in animal economy, the adrenals attracted attention but late in the history of medicine. The ancients were apparently unaware of their existence, though they recognized and described other glandular structures, such as the pituitary (Galen). Not until the Renaissance were the adrenals identified, when they were accurately described by the great mediaeval anatomist, Eustachius (1563). They were, however, destined to remain in relative obscurity until the early 19th century, when began an era rich in studies on the comparative and pathological anatomy of the adrenals, with which the name of Mekel is so prominently associated.

A new and fundamental approach to the understanding of the subject was made possible by the development of histological methods of investigation. These revealed that the finer structure of the gland is substantially the same in all vertebrates though only in mammals does the cortex encapsulate the medulla. Indeed, in some fish, e.g., Selachians (of which the skate is an example), these two tissues are quite separate, the cortical or interrenal tissue lying loosely attached to the posterior part of the kidney, and the chromaphil or medullary tissue being segmentally arranged in pairs associated with the sympathetic ganglia. This separation of the tissues, which becomes more marked as one descends the phylogenetic scale, is an indication of their independent origin. The chromaphil tissue arises from the same mass of neuroblastic ectoderm as the sympathetic ganglia; the cortical from the coelomic mesoderm near the genital ridge.

A new epoch in the history of the adrenal glands began with the publication in 1855 of Thomas Addison's description of the disease that now bears his name. Here for the first time was definite evidence of the physiological importance of these glands to life, and a concise statement of the outstanding characteristics of the disease. These are described in his classical treatise as: "anaemia, general languor and debility, remarkable feebleness of the heart's action, irritability of the stomach, and a peculiar change of colour in the skin

\*The first of a series of reviews of laboratory and clinical studies of hormones.

†Part II, *The Adrenal Cortex*, will be published in the March issue.



occurring in connection with a diseased condition of the 'suprarenal capsules'." This clinical description can hardly be improved to-day, though anaemia is not so marked a feature of the disease as the others he mentions. That anaemia is so prominently mentioned is not surprising for Addison was much interested in this subject, and it was while seeking to throw additional light upon the form of anemia termed "idiopathic" by him, "Addison's" or "pernicious" by us, that he came upon the syndrome described above.

While Mekeel and others had proposed extirpation experiments on animals, the expediency of this approach to the understanding of the function of the adrenals was not appreciated until the publication of Addison's observations on the suppression of adrenal function in man. Brown-Séquard was the first to respond to the stimulus supplied by the clinician. In 1856 he reported experiments in which he removed the glands in rabbits, guinea pigs, cats, dogs and rats and found that death followed shortly—in eight to thirty-six hours. This, with control operations similar in all respects except that the adrenal glands were not removed, led him to the conclusion that the adrenals were essential to the life of animals.

Opposition to this view quickly arose. It was contended that shock and sepsis and not adrenal insufficiency were the cause of the almost universal mortality. Philipeaux and Harley published accounts of the survival of rats for long periods. This contradictory evidence resulted in a temporary subsidence of such work and, although towards the end of the century experiments on adrenalectomy were once more resumed, the startling discovery in 1894, by Oliver and Schäfer, of the blood-pressure-raising property of extracts of the medulla of the gland, diverted attention for the next two decades to this aspect of the problem.

#### THE ADRENAL MEDULLA

Many years before the demonstration of the pharmacological effect of extracts of the adrenal medulla, it had been observed that this tissue had peculiar staining qualities. Vulpian, in 1856, described the green colouration which resulted on moistening the tissue with ferric chloride, and Henle, nine years later, observed that the cells of the medulla take on a dark brown hue when treated with potassium bichromate solution. It has subsequently been shown that this staining reaction is due to the presence in the cells of a high concentration of the substance epinephrine, the hormone of the medulla.

Although epinephrine has been found in the cortical tissue, and it has even been suggested that it is elaborated there, the explanation appears to be the rapidity with which diffusion takes place after death. Cortical tissue cut away from a gland immediately on removal from the animal with intact circulation does not contain epinephrine (Grollman). This fact and the presence of epinephrine in the chromophil tissue of certain fish where, as we have seen, the cortex is a separate organ, and its occurrence in the medullary tissue of the mammalian embryo before fusion with the cortex has taken place indicate that the anatomical proximity of the cortex is not essential for the production of epinephrine. This does not, however, rule out a functional relationship between the two tissues (Rogoff).

The similarity of the effect produced by the injection of the active agent of the medulla and the result of stimulation of sympathetic nerves was pointed out by Lewandowsky in 1898 and subsequently by Langley in 1901. The close similarity of epinephrine and sympathetic function has been amply confirmed and the minor exceptions understood by modern researches.

The epinephrine content of the adrenals is great, as indicated by the staining reactions. Each human adrenal contains about four milligrams and, since a small fraction of this amount injected intravenously produces a substantial rise in blood pressure, it is apparent that there is ample reserve. By prolonged stimulation of the splanchnic nerve, the mechanism by which epinephrine is released in the body, it is possible to obtain marked physiological effects for hours. Exhaustion of the supply is therefore almost an impossibility under normal circumstances since reformation is rapid.

### *Chemistry of Epinephrine*

The chemistry of epinephrine forms an interesting chapter in the study of hormones. On account of the relatively large amount of epinephrine in the glands, isolation and analysis were quickly accomplished. In 1901, Takamine and Aldrich independently isolated the hormone in crystalline form and named it "adrenalin", a term coined by Abel, but since early annexed for proprietary use the name epinephrine is used in the U.S.P. Aldrich ascribed the correct empirical formula for the hormone in the same year ( $C_9H_{13}O_2N$ ) and in 1905 Friedmann established its constitution. One year later Dakin and Stolz effected its synthesis. Although relatively insoluble in water, the salts of epinephrine are soluble. The hydrochloride is most commonly used.

For commercial purposes, both natural and synthetic sources are used in its manufacture. The amino acid tyrosine has long been supposed to be the source of epinephrine in the body, but attempts to effect a synthesis from this have been unsuccessful. In view of the close chemical relationship between tyrosine, epinephrine and the skin pigment melanin, it is thought that the pigmentation in Addison's disease occurs as a result of the suppression of the utilization of tyrosine by the adrenals in this disease. For further details readers are referred to the monographs listed in the bibliography.

The best known chemical method for the estimation of epinephrine is that of Folin, Cannon and Denis, 1912. While an exceedingly sensitive test, it is non-specific, other reducing substances such as uric acid and ascorbic acid (vitamin C), which is present in such large quantities in the gland, giving the blue colour characteristic of the test. This important fact must be kept in mind when analyses of tissues for their epinephrine content are made.

### *Physiology of the Adrenal Medulla*

The physiology of the adrenal medulla has attracted the attention of a very large number of workers in view of the striking effects which attend the administration of its hormone both in experimental animals and in man. In spite of the vast literature about the various aspects of the action of epinephrine, its role in animal economy is difficult to assess. For detailed accounts of the pharmacological effects of epinephrine, the reader is referred to mono-

graphs on the subject. In this section the occurrence of epinephrine in the blood and methods for its detection only will be dealt with.

*Biological assay* of the amount of the hormone in tissue fluids or extracts has been facilitated by the great physiological activity of epinephrine, which makes it possible to demonstrate the presence of concentrations as low as one part in 400,000,000. The inhibition of the movements of the rabbit's small intestine suspended in Ringer's solution and the contraction of the blood vessels of the perfused rabbit's ear (Pissemiski preparation) are perhaps the most sensitive tests, though the blood pressure of the decapitate cat is the standard method for the assay of epinephrine solutions. In the experimental animal the presence of epinephrine in the circulation can be tested by several methods. Most are based on the fact that denervation of an organ supplied by the sympathetic renders it sensitive to small amounts of the medullary secretion. Thus the iris of the cat contracts several days after removal of the superior cervical ganglion while the pupil expands, following injection of one part in 1,000,000, or less, of epinephrine. The contraction of the denervated nictitating membrane and the acceleration of the denervated heart in the cat are useful methods similarly sensitive.

Quantitative estimation of the amount of epinephrine liberated in the intact animal under various circumstances has been investigated chiefly by "auto assay" methods, the secreted hormone acting upon a sensitized and easily recognized indicator such as the pupil or denervated heart. Comparison is made with the effect of injected solutions of known strength. The "cava pocket" method introduced by Stewart and Rogoff has been extensively used for determining the rate of liberation of epinephrine. By occluding all but the adrenal veins entering the vena cava, a pocket can be made for collecting adrenal blood by clamping the cava both below the diaphragm and the gland. Assay can be done on the animal's own denervated organs or, after collection of the blood, the epinephrine content tested on the isolated gut. In order to obtain a true picture of the normal rate of secretion the conflicting influence of pain, anaesthesia and surgical trauma, which may all increase the rate of secretion, must be avoided. Ideal conditions in this respect have been most closely approximated by Sataké, Sugawara and Watanabé, 1927, in such studies. These workers cut the dorsal root fibres from the ninth thoracic to the third lumbar vertebra a month prior to the conduct of the experiment in which estimations of the rate of epinephrine secretion were carried out in dogs. Their results indicate that the blood coming from the adrenals contains an average of 0.0001 milligrams per cubic centimeter, or for both glands 0.00007 milligrams per kilogram body weight per minute, which is but one-quarter the figure given by Stewart and Rogoff, who used anaesthetized animals.

In the catodit blood of animals Schlossman, using the perfused rabbit's ear, found that the epinephrine content was less than one part in 1,000,000,000 and concluded that the peripheral blood is epinephrine-free normally.

*The secretion of epinephrine*, as already indicated, is under nervous control but, due to the rapid synthesis which occurs, it is almost impossible to exhaust

the store. There is probably a centre in the floor of the fourth ventricle of the brain which controls in some measure the nervous impulses which liberate epinephrine.

Of factors increasing epinephrine secretion, atnaesthesia, pain, hypoglycaemia and trauma have already been mentioned. In addition, sensory stimulation, including wide ranges of temperature and burns, haemorrhage and certain drugs such as morphine, nicotine and related substances, should be mentioned as having been proved to stimulate secretion in animals.

*The epinephrine content of human blood* is a matter worthy of determination. In man, however, it is obviously impossible to employ many of the methods so successfully utilized for studying epinephrine secretion in animals. The fact that shed blood generates inhibitor and constrictor substances has constituted the chief difficulty in testing samples of blood on isolated organs such as the rabbit's intestine. Within recent years, however, German investigators have utilized the perfused rabbit's ear with success, an ergotamized control ear serving to distinguish the constrictor substances other than epinephrine. Kahlson and Wertz, 1930, and Brandt and Katz, 1935, were unable to demonstrate epinephrine in normal human blood or in that of patients with hypertension, thyrotoxicosis or fever by this method though it is sensitive to one part in  $10^{10}$  or  $10^{12}$  epinephrine. The latter authors were, however, able to demonstrate the occurrence of epinephrine in the blood of patients following hypoglycaemia induced by insulin, a finding originally described by Cannon for animals.

In addition to the work cited, reference should also be made to recent observations of Euler, 1933, and Whitehorn, 1935, which indicate that under resting conditions there is considerable doubt as to its presence in the blood stream. This throws more than a shadow of doubt on its necessity for ordinary life processes. In fact, Rogoff, 1935, states that there is no substantial evidence that it plays any role in the maintenance of normal blood pressure, and this view is verified by investigations on adrenalectomized animals maintained in health by adequate amounts of adrenal cortical hormone. These animals have a normal blood pressure and respond normally to sympathetic nerve stimulation, which disproves the old contention of Elliott that epinephrine plays a part in the maintenance of sympathetic nerve function.

In seeking for an explanation of the *function of epinephrine*, the profound effect which this hormone is known to have on carbohydrate metabolism calls for brief consideration. The well known hyperglycaemia which follows the injection of epinephrine is accompanied by mobilization of liver and muscle glycogen and increase in blood lactic acid. When, however, liver glycogen is low, hyperglycaemia still occurs, so breakdown of stored glycogen is but part of the story. Much information has been accumulated on this aspect of medullary function, but for the time being these data do not lend themselves readily to interpretation, except as part of the "emergency function" hypothesis of Cannon, which contends that situations of stress result in a stimulation of the sympathetic and, hence, epinephrine secretion. The effect

of both systems being similar and reinforcing, the animal is better able to meet the situation. As an ancillary to this view may be added the suggestion of Sjöstrand, 1934, that epinephrine is functionally linked to the cortex of the gland and, as Grollman, 1935, points out, stimuli which call forth epinephrine secretion are the same as those which lead to increased utilization of the cortical hormone.

The use of epinephrine in medical and surgical practice is firmly established on a sound physiological basis. In asthma, urticaria, angio-neurotic oedema and serum sickness, epinephrine given subcutaneously in doses of 0.5 to 1.0 c.c. of the 1/1000 solution is extraordinarily beneficial (Christian, 1924). The use of a 1/100 solution sprayed on the nasal mucosa has been found effective in warding off imminent asthmatic attacks. Combined with local anaesthetics, epinephrine is useful in promoting more prolonged action, probably in virtue of its vasoconstrictor effect leading to slower absorption. In hypotension, epinephrine is of no use and in Addison's disease it may even be harmful, though it may be of use temporarily in a state of collapse to tide the patient over till more effective therapy can be instituted.

It should be emphasized that epinephrine is a dangerous drug if administered in doses larger than necessary to elevate the blood pressure effectively. This is especially true if the intravenous route is being utilized. Then one or two minims of the 1/1000 solution of the hormone should be well diluted with saline and given slowly. More may be given only if no untoward symptoms have appeared, but the utmost caution must be exercised, as the increased blood pressure may lead to stimulation of the vagus centre and consequent cardiac inhibition, and even to a fatal issue.

In concluding this section, it should be pointed out again that there is no evidence to show that increased secretion of the adrenal medulla plays any part whatsoever in hypertension, except in the exceedingly rare cases of medullary tumour (paraganglioma), and denervation of the glands is, therefore, not justified for this or probably any other condition. Indeed, Rogoff, 1935, reports a case in which Addison's disease followed upon such an operation.

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## MATERNAL WELFARE: THE NEED FOR FACTS

THERE is a conspicuous lack of satisfactory evidence as to the nature and extent of the risk to life and health among mothers in pregnancy and child-bearing and the factors which influence this risk. Particularly is this so in relation to the employment of nursing and medical supervision and care. As a result, there are insufficient data upon which to base a sound and constructive program for maternal welfare. There are, however, three types of approach which hold a measurable degree of merit as a source of the desired information and which as yet have not been explored.

The first of these is an inclusive survey of maternal morbidity and mortality on a large scale. Up to the present, investigations have been limited largely to mortality studies and the extension of such investigations to include all mothers is highly desirable. The objective of such a survey would be to clarify our present position in regard to the whole problem of maternal welfare. What proportion of women bearing children have adequate care according to present standards? How many mothers make contact with their physician as early as is considered desirable? What is the relative morbidity experience among women in various geographical areas, racial groups, etc.? What relationship has morbidity experience, and subsequent mortality as well, to the type of medical and nursing care provided? These and other questions are ones to which we have no satisfactory answer. A carefully planned survey of the experience of a large sample of mothers in Canada is needed to provide the facts.

A further source of information is the large volume of carefully compiled data recorded by the Victorian Order of Nurses. This material is susceptible of analysis and, along with other sources like it, should be studied. While such material as this has some limitations in application, due to the nature of the group included, the advantages which would accrue are substantial.

A third approach to the problem of maternal welfare requires that a review of past experience be made in order to learn something of the geographic varia-



tions in mortality which exist. As was found in England by the special committee studying this problem, there are undoubtedly areas of high and low mortality. Having determined whether or not such favourable and unfavourable areas exist, it remains to determine the explanation of them. In particular an explanation of the unfavourable experience in areas with a high mortality rate should be sought and a study of the causes of death involved, as well as other pertinent factors, made. Once having done this, a rational program in local areas, if desired, could be entertained and based on the findings. The dramatic results achieved in the Rochdale experiment in England justify a serious consideration of this type of approach.

In the past considerable emphasis has been placed, justifiably, upon the findings of maternal mortality surveys. But one cannot achieve much success in such a scientific endeavour without control groups which, in this case, are the women who do not die. Furthermore, there are many additional factors the influence of which should be assessed and this can be done only by a study of a large random sample of pregnancies. No health problem can be satisfactorily investigated from deaths alone.

The time is ripe for a study on a national scale, if possible, of all maternity cases regardless of their outcome. The need for such a piece of work is evident. If the funds and personnel can be provided for the exploration of the problem of maternal morbidity and mortality by any or all of the avenues of approach outlined above, a substantial contribution can be made to our knowledge in this field.

*A.H.S.*

#### PREVENTION OF TETANUS BY ACTIVE IMMUNIZATION

**I**N Canada in 1934 40 deaths were recorded from tetanus and of these 19 were under 15 years of age. Although numerically this number appears small, yet in the light of its preventability the toll is too large. Considering the wide-spread occurrence of tetanus spores in our environment, the small number of cases and deaths raises such questions as the immunity status of the population and the effect of the fairly general use of tetanus antitoxin as a prophylactic.

The prophylactic value of tetanus antitoxin has been thoroughly established. The protection conferred, however, is transitory and it is necessary to give further prophylactic doses until the wound has healed. The preparation of diphtheria toxoid and the demonstration of its value in preventing diphtheria was followed shortly by attempts to prepare a product of similar value in the prevention of tetanus. Tetanus toxoid has been prepared and its value has been successfully demonstrated by a number of years of experimental trial. It is produced by the addition of small amounts of formalin to tetanus toxin which after varying periods of incubation loses its toxic property but retains definite antigenic value.

Since tetanus toxin does not contain any cutaneous necrotoxic factor, it is not possible by skin test to determine the general extent of man's susceptibility by such a simple method. The only means as yet available for this purpose is

the titration of human serum for small quantities of tetanus antitoxin using guinea-pigs as test animals. Since it is well established that man is susceptible, until a reasonably large number of sera so tested show the presence or the development of amounts of antitoxin increasing with age, we must assume that there is no immunity conferred as the result of subclinical infection, if such occurs in tetanus.

Owing to the instability of tetanus toxin it has not yet been generally conceded that the phenomenon of flocculation has the same significances as has the analogous reaction with diphtheria toxin and toxoid. It therefore follows that we are not yet able to discuss tetanus toxoid in respect of antigenic units such as are applied to diphtheria products. The antigenicity of tetanus toxoid is, however, capable of demonstration in laboratory animals in terms of resistance to known quantities of toxin, as well as in terms of induced antitoxin. The development of tetanus antitoxin in man has been reported by various workers following the subcutaneous injection of tetanus toxoid or alum-toxoid, there being consistently uniform findings that man does produce measurable amounts of tetanus antitoxin after the injection of the specific toxoid. Whether the amounts of antitoxin so induced render these individuals insusceptible to clinical tetanus remains to be established. Recently an immunity of animals receiving tetanus toxoid to the inoculation of lethal spore doses of *Cl. tetani* has been demonstrated (1) (2), which finding is highly suggestive. From the current literature there has been no significant comment as to the prevalence of local or general reactions following the use of unaltered tetanus toxoid, in spite of the fact that adults appear to have formed the majority of the reported subjects.

It appears to be justifiable to conclude that it is possible actively to immunize man against tetanus by the subcutaneous injection of tetanus toxoid and that while the hazard of this disease is not as apparent in the community as many others, this toxoid should serve the purpose of affording protection (probably permanently) against tetanus to those whose habits and pursuits expose them most to the disease. By these, amongst others, one must consider children and the motoring public who today are afforded only a passive protection by the injection of tetanus antitoxin when occasion warrants.

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## ASSOCIATION NEWS

### THE ANNUAL MEETING

**T**HE Canadian Public Health Association's twenty-sixth annual meeting will be held in Ottawa on June 17th, 18th and 19th. As a convention city Ottawa can hardly be excelled and it is fitting that the national association concerned with the broad field of public health should convene in Ottawa at frequent intervals and give evidence of the Association's contributions to the advancement of preventive medicine throughout Canada.

CANADIAN PUBLIC HEALTH ASSOCIATION	
26TH ANNUAL MEETING	
OTTAWA	
•	
JUNE	
17	
18	
19	
•	
1937	
ONTARIO HEALTH OFFICERS ASSOCIATION	
23RD ANNUAL MEETING	

Of significance is the decision of the Department of Health of Ontario to make an exception to the policy of convening the annual meeting of the Ontario Health Officers Association in Toronto, in close contact with the Department offices, and to hold this year's annual meeting jointly with the Canadian Public Health Association. It is expected that the largest attendance of the Ontario Health Officers Association will be recorded on this special occasion.

The holding of the joint meeting is in accord with the policy of the Canadian Public Health Association of joining with the various provincial associations in the conduct of the annual meetings, which are held in

turn in cities in the western, central, and eastern areas. The decision to hold this year's meeting in the capital city was made by the Executive Committee after considering the desirability of meeting in the central area following last year's meeting on the Pacific coast. It was decided also that the cordial invitation of the city of Halifax and of the province of Nova Scotia would receive first consideration among the invitations for the convention in 1938.

It is anticipated that more than five hundred physicians will be in attendance at the combined meetings and that the personnel of health departments, including public health nurses, laboratory directors and technicians, sanitary engineers, epidemiologists and vital statisticians, and others engaged in public health work in the field and in the laboratory will be present in such numbers that the attendance will exceed that of any previous meeting convened by the Association.

From the standpoint of the attendance of health officers, the annual meetings of the Association are outstanding. The expected attendance at the Ottawa meeting of more than five hundred of the two thousand physicians who are serving as health officers in Canada is a challenge to the committee in charge of arrangements to provide a program that will fully meet the needs of administrative health officers both of small rural areas and of urban municipalities. The annual meeting therefore is the occasion for the presentation of new programs and the evaluation of the results obtained in specific fields of endeavour. Section meetings in the fields of epidemiology and vital statistics, social hygiene, mental hygiene, public health nursing, public health engineering, and laboratory work will add greatly to the value of the meeting. In preparing the program the General Secretary of the

Association will be pleased to receive titles of papers for the committee's consideration. It is hoped that the program will permit of more adequate time for the discussion of papers, so that as many members as possible may participate.

It is planned to supplement the program by scientific and commercial exhibits. The value of scientific exhibits is being increasingly recognized and it is because of this appreciation of the contribution which such exhibits can make that the committee in charge of the meeting is making arrangements for their financing. The program of entertainment is being arranged by an enthusiastic local committee and opportunities will be given to visit the Parliament Buildings, the Laboratory of Hygiene, the Dominion Bureau of Statistics, and the Animal Diseases Research Institute in Hull, Quebec, as well as the Ottawa Filtration Plant and the Dominion Experimental Farm. A cordial invitation has been extended by Dr. T. A. Lomer, Medical Officer of Health of the city of Ottawa, to the members of the Association to visit the Department. The achievements of the Department of Health are well known to health officers throughout Canada and the opportunity of visiting the Department will be welcomed. Provision will be made for visits to the various divisions.

The growth of the work of the Association is evidenced by the decision of the Executive Council to convene on the day previous to the formal sessions, namely Wednesday, June 16th, to permit of spending the entire day in considering reports and plans. The annual meeting therefore will occupy four days and this provision for the more adequate discussion of the Association's work will undoubtedly result in the more effective functioning of the Association's national undertakings.

The members of the local committees are as follows:

General Committee—*Chairman*, Dr. R. E. Wodehouse; *Vice-Chairman*, Dr. T. A. Lomer; *Secretary*, Dr. J. J. Heagerty. Accommodation Committee, *Chairman*, Dr. F. S. Burke; *Secretary*, Dr. F. S. Parney. Publicity Committee, *Chairman*, Dr. N. L. Burnette; *Secretary*, Miss Lillian Crawley. Entertainment Committee, *Chairman*, Col. J. T. Clarke; *Secretary*, Miss E. L. Smellie. Transportation Committee, *Chairman*, Dr. G. J. Wherrett; *Secretary*, Dr. E. L. Stone. Registration and Reception Committee, *Chairman*, Miss Alice Ahern; *Secretary*, Miss F. Young. Finance Committee, *Chairman*, Dr. J. F. Argue; *Secretary*, Dr. C. P. Brown. Exhibits Committee, *Chairman*, Dr. N. MacL. Harris; *Secretary*, Dr. F. L. Letts.

#### STUDY COMMITTEE, PUBLIC HEALTH NURSING SECTION

A MEETING of the Study Committee of the Public Health Nursing Section will be held in Toronto at an early date to consider the replies received to a questionnaire sent during the summer and fall to 128 health departments, non-official health agencies, and industrial and commercial firms employing public health nursing personnel. The response has been excellent and the information which has been obtained concerning employment policies and standards for supervisors and staff nurses will be of great assistance to the committee in formulating standards for the employment of public health nurses in Canada. The members of the committee include Miss Laura A. Gamble, Toronto, *Chairman*; Miss Edna L. Moore, Miss Isabel McEwen, Miss Muriel MacKay, and Dr. L. A. Pequegnat, Toronto; Miss Alice Ahern, Ottawa; Miss Marion Lindeburgh, Montreal; and Miss Mildred I. Walker, London.

## PLANS, PROGRAMS, AND PROGRESS

### AN OUTBREAK OF BACILLARY DYSENTERY (SHIGA) IN SASKATCHEWAN

**R**URAL Municipality No. 136 is located about ten miles east and south of Swift Current, Saskatchewan, and contains a large Mennonite settlement. In August, 1936, a Mennonite from Mexico visited the district and within a few days a severe case of dysentery developed at the home where he was staying. The first patient, a boy about two years of age, died after being ill only six days. Lunch was served at the funeral. A few days later, cases of dysentery began to develop among those who had partaken of the lunch. The father of the boy and a four-year-old child in the same family contracted the disease but recovered. At the grandfather's home twelve cases developed, with six deaths—one on September 2nd, two on September 4th, one on September 13th, and two on September 14th. Two of those dying were over twenty years of age and four were under five years. Many cases of dysentery developed among those who attended the funerals at the grandfather's, at which lunch likewise was served. When a case developed in a family, practically all the other members were similarly affected in a few days. All cases could be traced either directly or indirectly to the homes where the first funerals had been held and lunch served. In addition to the family with six deaths, there were two families with four deaths each and one family with two deaths.

The outbreak was not reported to the Department of Public Health until September 14th, when there had been 59 cases and 18 deaths. Investigation was made on September 15th and samples of blood and faeces were obtained. The blood samples gave a positive agglutination for bacillary dysentery (Shiga), and a negative Widal test. Some laboratory work on faecal specimens was undertaken but

definite findings were not reported. The Provincial Laboratory made its report on December 17th and as soon as it was definitely shown that the infection was bacillary dysentery (Shiga), attempts were made to obtain anti-dysenteric serum. As there has been only a small demand for this serum in Canada, it was difficult to obtain quickly. Sufficient was obtained, however, and used both as a prophylactic and for treatment, with very satisfactory results.

Although all age-groups from 5 months to 50 years were affected, the majority of cases were in children under 15 years of age. Males and females were affected about equally. Children did not appear to have the same resistance as adults, as only three adults died. The incubation period was very short, being from two to three days, and terminated in diarrhoea. In a day or two mucous was passed, and later blood was passed with the mucous. There was no abdominal distention, but rather the abdomen was quite flat. There was a great deal of tenesmus, with abdominal pain. The tongue was slightly coated but comparatively moist. In some patients there was retention of urine; in none scalding of buttocks. Only a few vomited. The temperature generally was not higher than 101. per rectum. In a very few days the patient becomes very emaciated, anaemic and dehydrated. A few of the patients in this outbreak died within four days, the usual period being from 6 to 7 days. After the seventh day the prognosis was much better.

This is the first epidemic of the Shiga type of dysentery known to the Department. Whether or not the visitor from Mexico was a carrier has not been determined but enquiries are still being made. He was said to have stated that his own child had died in Mexico some months before from a

very similar complaint and the man himself was reported to have been somewhat sickly.—*F. C. Middleton, M.D., D.P.H., Director, Division of Communicable Disease, Provincial Department of Public Health, Regina.*

#### HEALTH INSURANCE IN BRITISH COLUMBIA

ON March 1st the first government health insurance scheme in North America will be in operation in British Columbia. Between 90,000 and 100,000 workers, with their dependents, are included. The scheme will provide medical care, hospitalization, maternity care, x-ray and laboratory services. It is required that everyone coming within the insurance act must register. Any worker who neglects to register deprives himself of the benefits although he is still required to make his contribution. Of 17,000 employers approximately 1,000 have not yet filed their lists of employees despite three formal notification letters.

All employed persons earning \$1,800.00 a year or less, except agricultural workers, domestic servants, Christian Scientists, certain seasonal and part-time workers and those already in satisfactory industrial medical services are required to pay 2 per cent. of their salary. To the amount contributed by the employee the employer is required to add 1 per cent. of the employee's salary. The wage-earner must contribute for four weeks before the benefits are provided. The Act provides for choice of physician, prenatal and maternity care, surgical services, hospital care not exceeding ten weeks for any one sickness, and 50 per cent. of the cost of necessary drugs. Exempted from the benefits are cases of tuberculosis, venereal disease, or mental ailments which are treated free at provincial clinics and institutions.

Final arrangements have not been completed with the British Columbia Hospitals Association and with the College of Physicians and Surgeons

of British Columbia in regard to the provision of hospital and medical services. The Provincial Government's direct contribution has been \$100,000 for the purposes of organization. Otherwise the Province will contribute only in the capacity of an employer and it is estimated provisionally that this will amount to \$35,000 annually. Dr. E. L. Garner has been appointed director of medical services under the Commission.

#### CONFERENCE OF VENEREAL DISEASE CONTROL WORK

AT the call of Dr. Thomas Parran, Surgeon General, a three-day conference on the control of venereal disease was convened in Washington on December 28th to 30th. Seven hundred and fourteen delegates were registered, including members from several departments of health in Canada.

In opening the conference, Dr. Parran stressed the need for further expenditure and efforts in the control of syphilis. The conference urged the federal authorities to make available an emergency appropriation of \$25,000,000 to combat the spread of syphilis and gonorrhoea. According to Dr. William F. Snow, General Director of the American Social Hygiene Association, about 6,000,000 men, women and children in the United States are infected with syphilis, although not one in ten is under treatment by a licensed physician. The amount of gonorrhoea is almost twice as great. Dr. Snow predicted that greater progress would be made in 1937 than in any previous year because of the changed attitude of newspapers and magazines which now are making possible the attention of the general public through frank and scientific discussion. Dr. Parran emphasized that many physicians are not prepared to give adequate treatment, that laboratory facilities have to be considered and improvements made, and that there is a need for more assistance from public health departments.



Among the many papers presented were: Recent Extension of Venereal Disease Control Work, by R. A. Vonderlehr, Assistant Surgeon-General; The Venereal Disease Control Program in New York State, by Dr. Edward S. Godfrey; The Venereal Disease Control Program in Kansas, by Dr. Earle G. Brown, Topeka; A Typical Municipal Venereal Disease Program, by Dr. Walter Clarke, New York City; The Modern Clinical Management of Gonorrhoea, by Dr. P. S. Pelouze, University of Pennsylvania; Clinical Problems in Syphilis Control To-day, by Dr. John H. Stokes, University of Pennsylvania; Public Education in the Control of Syphilis, by Paul de Kruif; Citizen Support in Syphilis Control, by Homer Folks, New York; Notification Procedures, by Dr. Daniel G. Gill, Alabama; Epidemiological Methods, by C. A. Sargent, Buffalo; and The Physician and the Control of Prenatal Syphilis, by Dr. A. B. Cannon, Columbia University.

#### SURVEY OF MENTAL HEALTH HOSPITALS IN ONTARIO

**E**ARLY advantage was taken by the Administration in Ontario of the opportunity made possible, through the Committee recently formed to promote mental hospital services in the United States and Canada, to secure a survey of the circumstances responsible for the increasing demand for hospitalization of the mentally ill.

The Government of the province has for some years realized that measures had to be taken to provide more in the way of adequate accommodation and effective treatment for the large number seeking admission to the thirteen state-operated hospitals.

Not only does such a survey include a review of the limitations of the present buildings and equipment, the number and qualifications of the attending personnel and the scope of treatment offered, but it must give consideration to the problem of early

recognition and earlier treatment of the group of diseases which necessitate the patient's demanding prolonged and costly treatment in institution.

The survey party consists of Dr. Samuel W. Hamilton, Medical Director, and Dr. G. A. Kempf, Associate Medical Director; the assisting staff are supplied by the provincial Department. Dr. Hamilton was formerly Assistant Medical Director, Bloomingdale Hospital, and has an acknowledged reputation in the field of mental hygiene on this continent. Dr. Kempf is a member of the staff of the U. S. Public Health Service on loan to the Survey Committee. Both physicians have been devoting their best efforts to the project since early November. Their report is anticipated in Ontario with interest.

#### HAEMOLYTIC STREPTOCOCCUS IN SCARLET FEVER

**F**OR the past four years cultures have been made from the throats of scarlet fever patients admitted to the Isolation Hospital in Edmonton and a study made of the occurrence of the B type of haemolytic streptococcus. Dr. Donaldson has recently completed an analysis of the figures covering this period. Of the 435 patients from whom cultures were received, 96.5 per cent. had a positive culture at some time during the period prior to discharge. Fifty per cent. became negative by the end of three weeks. At the time of discharge 276 were still positive.

#### ANOTHER ADVANCE IN MENTAL HYGIENE

**T**HE mental hygiene clinic of the Hospital for Sick Children, Toronto, the first clinic of its kind to be associated with a children's hospital in Canada and the fourth to be established on the continent, was formally opened on January 23rd. Evidence of the wide interest in this most recent example of co-operation

between paediatrist and psychiatrist was the presence of Dr. Edward A. Park, professor of paediatrics, and Dr. Leo Kanner, associate professor of psychiatry, of Johns Hopkins University, and of Dr. Charles Bradley of East Providence, R.I., medical superintendent of the Emma Pendleton Bradley Home, the only hospital in the United States devoted entirely to the neurological and behaviour problems of children. The building, which is located on hospital grounds south of the nurses' residence, has a homelike atmosphere. General examination is made in a large, well lighted playroom equipped with toys and blackboards. In addition to being connected directly with the hospital, the clinic will be associated with the department of psychology of the University of Toronto, and thus will not only be of service to the community in preventing many of the mental defects of adult life that have their beginning in childhood but will also furnish valuable material for study.

#### PERSONALS

**D**R. GEORGE R. WALTON, D.P.H., has been appointed medical officer of health of Regina, Sask. Dr. Walton, who served in the Great War, graduated in medicine from the University of Toronto in 1923. After an internship in the Regina General Hospital in 1923 he practised with Dr. R. G. Scott at Watrous. In 1927 he was appointed medical officer to the Department of Railways and Canals, Canada, and was in charge of the department's hospital and medical work at Churchill, Manitoba, for six years. In 1933 he resigned this appointment to take the course leading to the Diploma in Public Health at the School of Hygiene, University of Toronto, and thereafter

spent a year in research work in the School. Before taking up his duties in Regina, he served as medical officer of health of Pelee Island, Ontario.

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Dr. William Boyd, M.R.C.P. (Edin.), F.R.C.P. (Lond.), at present professor of pathology in the University of Manitoba, has been appointed professor of pathology in the University of Toronto and will assume his duties on July 1st. Dr. Boyd is well known as the author of several standard text books in pathology and has been professor of pathology in the University of Manitoba since 1915.

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Dr. James Miller, F.R.C.P., F.R.S. (C.), professor of pathology in Queen's University, has been appointed honorary consultant in pathology to the Department of Health of Ontario, succeeding the late Dr. Oskar Klotz.

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Miss Lucy Eleanor (Nora) Moore, Reg.N., director of public health nursing in the Department of Public Health, Toronto, died on January 17th after a short illness. Miss Moore was born in St. Catharines, Ontario, and was the only daughter of Mrs. Moore and the late Canon R. J. Moore, for many years rector of St. George's Anglican Church, Toronto. She was a graduate of the Hospital for Sick Children, Toronto, and had undertaken post graduate work at Bedford College, London, England. Miss Moore had been associated with the public health nursing service of Toronto for twenty-five years, serving as director of the division during the past four years. She was a distinguished nurse and a most able administrative officer.

## BOOKS AND REPORTS

**The Problem of Nutrition.\*** *A series of four reports published by the League of Nations, Geneva, 1936. Canadian agents: The League of Nations Society in Canada, 124 Wellington St., Ottawa, 43 St. George St., Toronto, and Sun Life Bldg., Montreal.*

Volume I: Interim Report of the Mixed Committee on the Problem of Nutrition. 98 pages. Price 50 cents (55 cents postpaid).

IN 1935 the Health Committee of the League of Nations appointed a committee of recognized experts from various countries to consider adequate nutrition and its relation to agriculture and economics. This committee has published a series of valuable reports, of which the present one is a particularly good example. It summarizes all the general discussions and conclusions of the committee to date and provides the basis for a consideration of the more technical reports. Among the subjects discussed are the principles of correct nutrition, poverty as the principal cause of malnutrition, and the benefits to agriculture which would result from an increased consumption of protective foods. The section on dietary standards is especially commendable. The ninety-eight pages of this report contain so much information on nutrition, written in a readable style and giving the conclusions of authorities on the subject, that the report can be highly recommended to every person interested in public health. The review may be suitably concluded with reference to a major recommendation of the committee, that the campaign for better nutrition should take its place as an integral part of national policy. This would require the supervision of some central authority and would involve the closest co-operation between research, family assistance, education,

and agricultural policy. The reading of this report and others in the series should convince anyone that such a national policy is highly advisable.

E. W. McHenry

Volume III: Nutrition in Various Countries. 271 pages. Price \$1.40 (\$1.50 postpaid).

THIS is a compilation of reports sent by authorities in various countries to the League's Committee on Nutrition. Many of the reports are interesting and offer useful methods of disseminating nutritional information. However, the critical reader is given the impression that reports from some countries, at least, are enthusiastically written to serve as propaganda. For example, the Italian report deals largely with efforts made to render the population independent of the effects of sanctions. Canada's contribution consists of a paragraph of six lines on page 215. This paragraph says that various government departments carry on a constant educational program and closes with the sentence: "These programs, which are not closely co-ordinated, are based on professional and technical knowledge." The unfortunately true commentary which might be made is that comparatively little is done in Canada along the public health aspects of nutrition.

E. W. McHenry

Volume IV: Statistics of Food Production, Consumption and Prices. 110 pages. Price 75 cents (81 cents postpaid).

THIS report clearly brings to mind the economic aspects of nutrition. Little can be accomplished by educational programs urging people to eat suitable diets if recommended foods are scarce or expensive. Canadian statistics in this volume should be of particular interest to readers of this Journal. Consumption of wheat products, sugar and beef is shown to

\**The Physiological Bases of Nutrition, which was reviewed in the JOURNAL last November (page 579), was reprinted as Volume II of this series. Copies of Volume II (27 pages) are available for 15 cents (17 cents postpaid). The set of four volumes sells for \$2.80 (\$3.00 postpaid). Copies of these reports will be available until the end of February, when the League of Nations wishes all unsold copies to be returned to Geneva.*

have decreased since 1928. An explanation may be found in the tables of wholesale and retail costs of these and other foods. In the case of all foods listed for Canada there has been a decline in consumption where the retail price failed to diminish in proportion to the fall in wholesale prices. In 1934 the wholesale price for wheat was 55 per cent. of the 1928 price, yet the 1934 retail price was 76 per cent. of the 1928 value. On the other hand, the retail price of butter kept pace with the wholesale decline and this food-stuff showed an increase in consumption. A critical study of the statistics in this volume would be of value to public health officials.

E. W. McHenry

**Quarterly Bulletin of the Health Organization of the League of Nations, Volume V, No. 3, September, 1936.** Published by the League of Nations Publications Department, Geneva, Switzerland, 1936. Canadian agents, League of Nations Society in Canada, 124 Wellington St., Ottawa, 43 St. George St., Toronto, and Sun Life Bldg., Montreal. 570 pages. Price 65 cents.

THIS number of the Quarterly Bulletin is devoted wholly to nutrition. Undoubtedly, nutrition and related social problems are beginning to occupy the more significant place they deserve in public health. In this bulletin is included the report of the Technical Commission of the Health Committee of the League of Nations on the Physiological Bases of Nutrition. The section dealing with the nutritional requirements of infants and adolescents is presented in terse, convenient form. Another article dealing with the need for a biological supervision of food urges that, in the interests of public health, organized control of advertisements and artificial vitaminizations should be instituted.

This volume reports further of the excellent work done recently by the Health Committee on a human problem of vital importance.

A. H. Sellers

**Experimental Epidemiology.** M. Greenwood, A. Bradford Hill, W. W. C. Topley, and J. Wilson. *Special Report Series, No. 209, Medical Research Council, London.* Published by His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C.2, 1936. 204 pages. Price 3s. 6d.

THE classical work of Greenwood, Topley, and their collaborators in attempting to place epidemiology on an experimental basis has blazed a new trail in epidemiological research. The methods which these workers employed were designed to add to our knowledge of the behaviour of herds under certain controlled conditions of infection and immunity. Several preliminary reports have, of course, been published at intervals and these have served to attract wide attention to the experiments being undertaken. The work, however, has been extensive and prolonged, covering a period of 15 years, and this report presents in comprehensive fashion a review of the experiments and findings of the workers.

The many pertinent questions regarding herd infection and immunity which prompted this striking work can be answered as yet only in part and the chief merit of the work lies not in the conclusions which can be drawn from it, which are limited, but in the opening of a new avenue of scientific approach to epidemiological problems. The collection of the necessary statistical data in the field is beset with many difficulties and furthermore the method of the experimental epidemic affords a more natural and more severe test for the value of any prophylactic agent than do any methods now available. It must certainly be borne in mind, however, that the methods herein reported can never replace field observations under natural conditions. Doubtless this work "may indicate possible solutions to many practical problems and direct the epidemiologist along the most fruitful lines of inquiry."

A. H. Sellers

